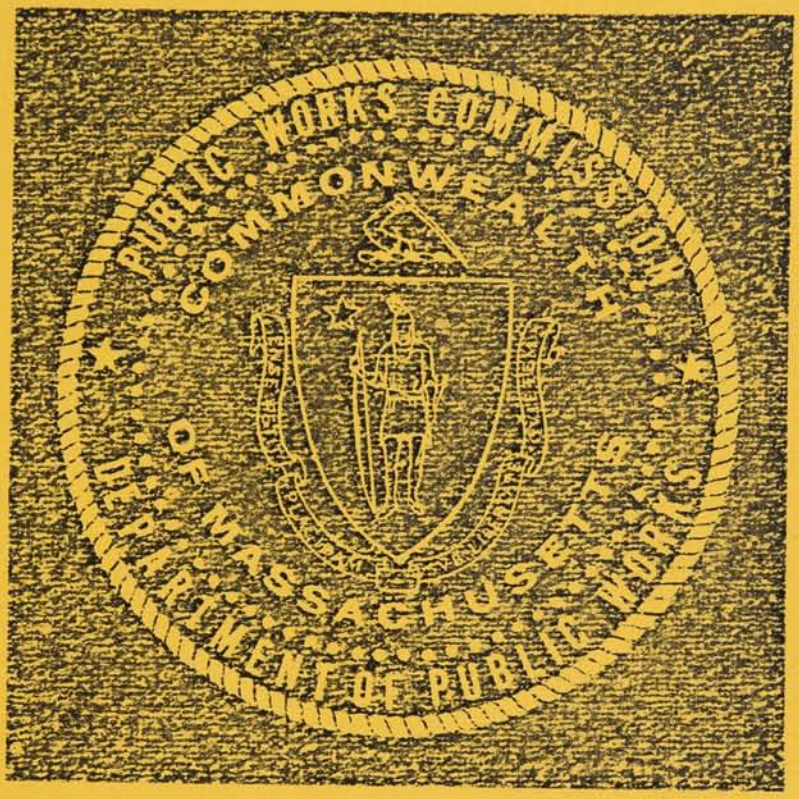
ANNUAL REPORT



1976

ANNUAL REPORT

JULY 1, 1975 THROUGH JUNE 30, 1976

MICHAEL S. DUKAKIS
Governor

FREDERICK P. SALVUCCI
Secretary of
Transportation & Construction

DEPARTMENT OF PUBLIC WORKS

JOHN J. CARROLL
Commissioner

ROBERT T. TIERNEY
Chief Engineer

The Commonwealth of Massachusetts
Executive Office of Transportation and Construction
Department of Public Works
Office of the Commissioner
100 Nashua Street, Boston 02114

November 29, 1976

His Excellency Governor Michael S. Dukakis,
Frederick P. Salvucci,
Secretary of Transportation and Construction
and the Great and General Court of the
Commonwealth of Massachusetts

Gentlemen:

I am transmitting herewith our Department's Annual Report for the fiscal year ended June 30, 1976. During the period covered by this report, the Department advertised $100,000,000 in highway construction and related contracts. This figure is expected to reach $200,000,000 before the end of 1976. This amount combined with our previous record $220,000,000 advertised in 1975 makes these two years the most productive in the Department's history and has been a positive step towards revitalizing the economy of Massachusetts.

Sincerely,

JOHN J. CARROLL
COMMISSIONER

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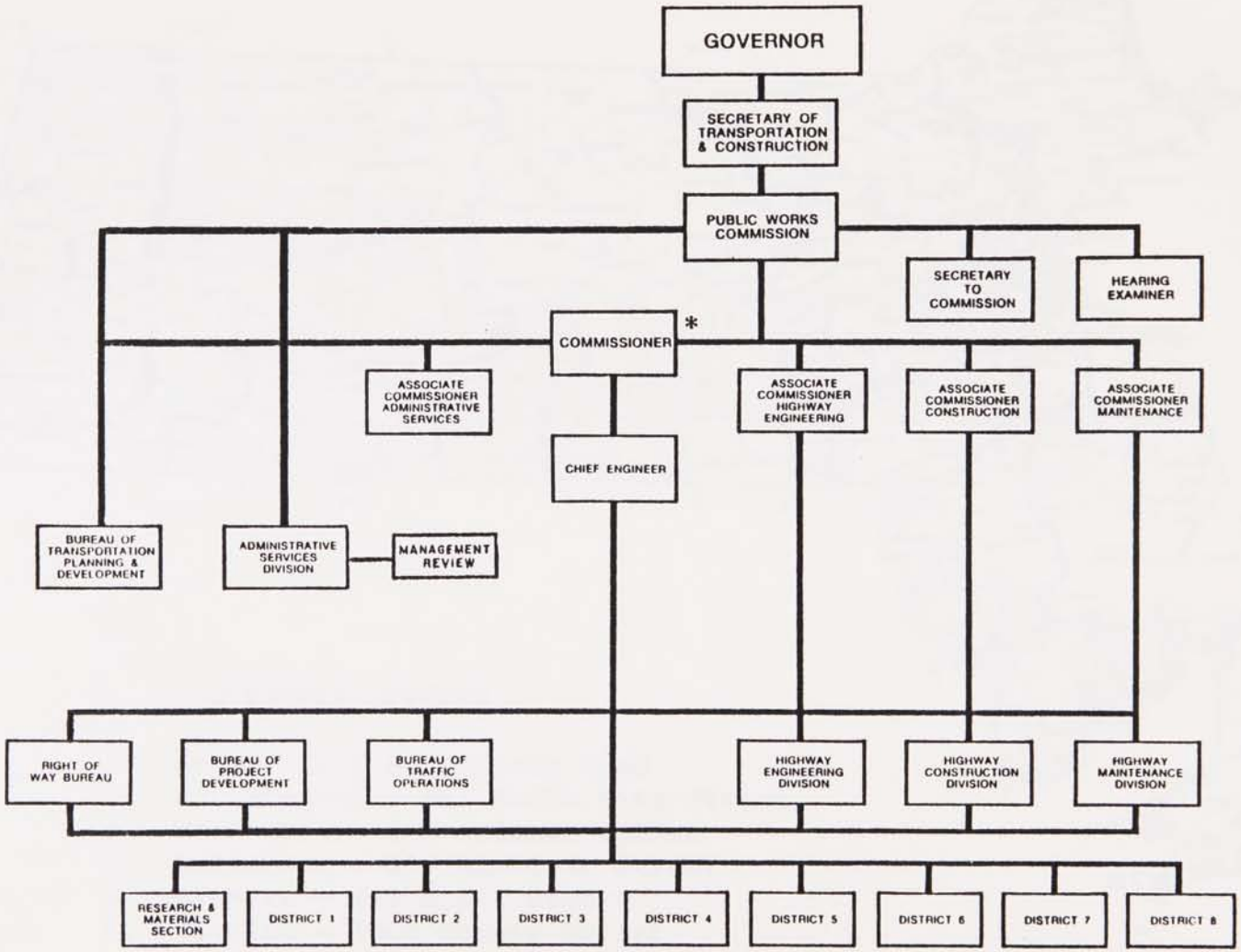
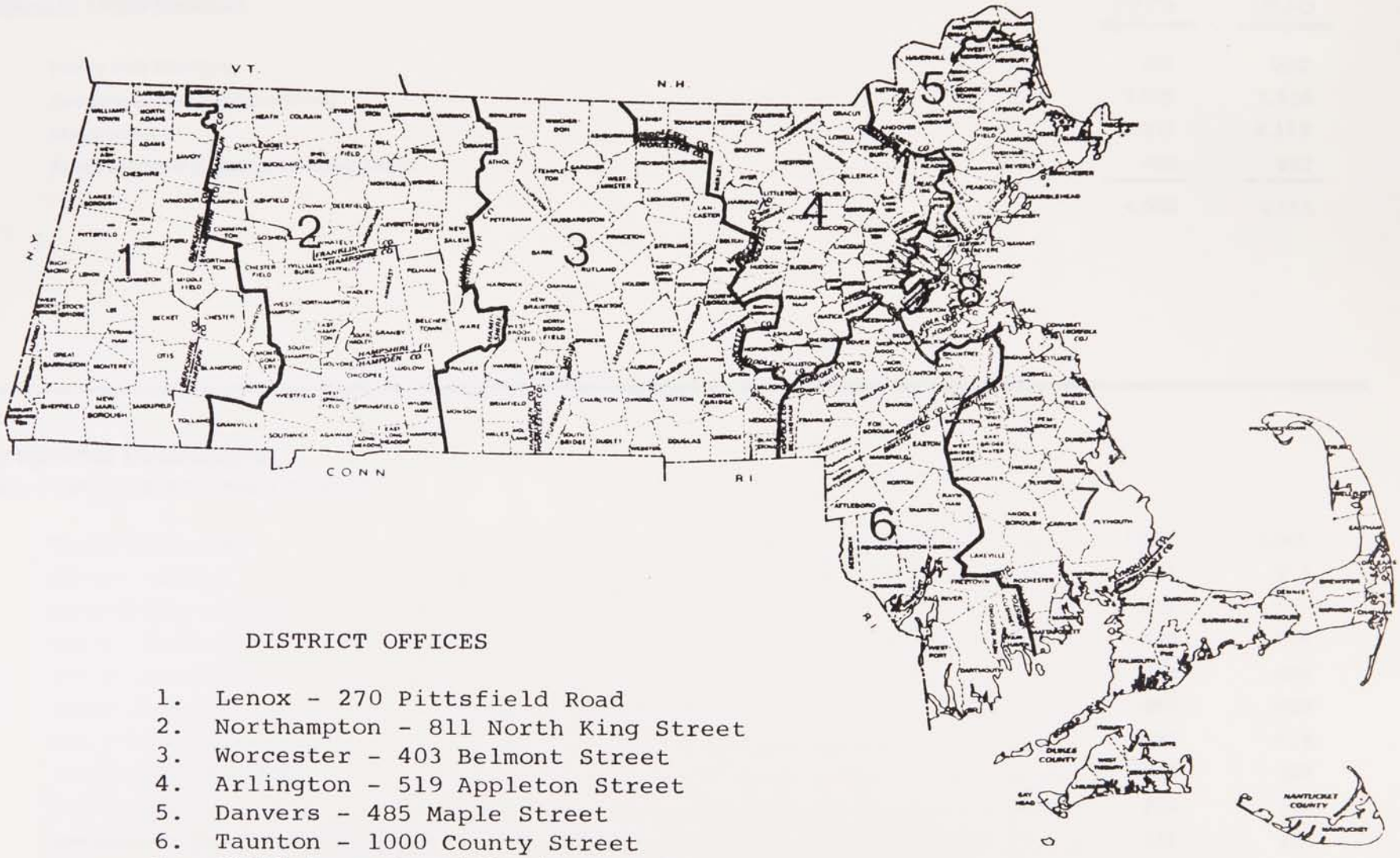
Massachusetts Department of Public Works



*COMMISSIONER ASSUMES ONE OF THE BELOW ASSOCIATE COMMISSIONER'S RESPONSIBILITY

MASS. D.P.W. DISTRICT BOUNDARIES



DISTRICT OFFICES

1. Lenox - 270 Pittsfield Road
2. Northampton - 811 North King Street
3. Worcester - 403 Belmont Street
4. Arlington - 519 Appleton Street
5. Danvers - 485 Maple Street
6. Taunton - 1000 County Street
7. Middleborough - 151 Pierce Street
8. South Boston - 400 "D" Street

Number of Employees in the Massachusetts Department of Public Works

Functional Distribution

	1975	1976
Policy and Planning	212	202
Construction and Engineering	1,620	1,435
Maintenance	2,327	2,179
Administrative Support and Overhead	400	347
Total	4,559	4,163

Geographical Distribution

(excludes Waterways & Solid Waste Divisions)

Boston Headquarters	1,162	1,040
District 1 (Lenox)	227	211
District 2 (Northampton)	354	327
District 3 (Worcester)	439	416
District 4 (Arlington)	453	408
District 5 (Danvers)	394	368
District 6 (Taunton)	633	588
District.7 (Middleborough)	440	391
District 8 (Boston)	255	230
Wellesley (Maintenance and Sign Shop)	135	124
Wellesley (Research and Materials)	67	60
Total	4,559	4,163

SUMMARY OF DPW

HIGHWAY CONSTRUCTION AND MAINTENANCE

CALENDER YEAR	ACCELERATED HIGHWAY PROGRAM ACTS	$ VALUE OF CONST. PROJECTS ADV.	# LANE MILES STATE HWYS. MAINTAINED
1960	$ 86,000,000	$ 75,000,000	7049
1961	90,000,000	73,000,000	7243
1962	110,000,000	79,000,000	7522
1963	125,000,000	86,000,000	8133
1964		73,000,000	8300
1965	320,000,000	62,000,000	8614
1966		90,000,000	8443
1967	300,000,000	101,000,000	8754
1968		63,000,000	8936
1969	260,000,000	173,000,000	9266
1970		63,000,000	9395
1971		79,000,000	9530
1972	561,000,000	143,000,000	9780
1973		92,000,000	10550
1974		136,000,000	11438
1975	353,000,000	187,000,000	11566
1976		198,000,000 est.	11750 est.

5 YEAR SUMMARY (AVERAGE/YEAR

	CONSTRUCTION PROJECTS ADV. ($)	# LANE MILES MAINTAINED
1961-1965	75 million	8,000
1966-1970	100 million	9,000
1971-1975	130 million	10,500

PROJECTS ADVERTISED

(Fiscal Year 1976)

July	1975	$ 6,399,630.
August	1975	6,637,153.
September	1975	2,599,184.
October	1975	114,398.
November	1975	17,439,793.
December	1975	5,277,678.
January	1976	3,737,717.
February	1976	1,027,038.
March	1976	3,588,651.
April	1976	2,707,990.
May	1976	8,673,903.
June	1976	41,667,275.
	TOTAL	$ 99,870,410.

MASSACHUSETTS FEDERAL HIGHWAY ADMINISTRATION
APPORTIONMENTS

Category	Fiscal Year 1975	Fiscal Year 1976	Fiscal Year 1977
Interstate	91,864,780	99,094,511	1,440,925
Primary Rural	6,878,393	7,702,920	-
Consolidated Primary	-	-	20,276,525
Secondary Rural	3,319,883	3,710,370	3,221,459
Urban System	23,697,608	23,760,384	23,944,099
Urban	9,516,340	9,248,193	-
Priority Primary	4,006,315	5,952,685	-
Hwy.Planning Research(1 1/2%)	2,084,128	2,117,850	744,409
MTA Planning (1/2%)	906,375	922,320	945,715
High Hazard Locations	1,642,234	1,626,225	-
Elim. Rds. & Obstacles	1,642,234	1,626,225	-
High Hazard-Roadside Obstacles	-	-	2,723,279
Rail-Hwy. Crossings (on sys)	1,487,472	1,294,977	2,458,456
Rail-Hwy. Crossings (off sys)	-	-	1,475,074
Pavement Marking Fund	462,191	-	764,537
Safer Rds. Demonstration	2,198,820	2,102,907	-
Off System Roads	-	1,349,555	-
Safer Rds.-Off Sys. Roads	-	-	3,323,025
TOTAL	$149,706,773	$160,509,122	$61,317,503

BUREAU OF TRANSPORTATION PLANNING & DEVELOPMENT

BUREAU OF TRANSPORTATION PLANNING AND DEVELOPMENT

The Bureau of Transportation Planning and Development is charged by the Legislature with the primary responsibility for transportation planning within the Commonwealth and with coordinating the transportation related efforts of other State agencies.

Since its formation in 1964 as part of the State's response to the 3C process requirement of the 1962 Federal Highway Act (the call for comprehensive, cooperative and continuing transportation planning in urbanized areas), the BTP&D's role has changed significantly. While the Bureau has retained its functions of data management and technical analysis, it has shifted its emphasis to the development and support of a policy-oriented, decentralized and participatory planning process, involving consideration of a broad range of impacts and improved interagency coordination. This evolution of BTP&D's role is part of the major reorganization of the transportation planning and decision-making process within the State - an effort aimed at revitalizing the 3C process so as to meet Federal requirements in spirit as well as in letter of the law, and to achieve the State's goal of cooperative development of a balanced transportation system consistent with and supportive of state, regional and local growth and development goals and objectives.

To document the 3C planning process, Federal law has required each State to produce an "Action Plan." The Director and staff members of BTP&D played key roles in the development of the initial

Massachusetts Action Plan as approved and implemented. The Bureau is participating in an update of the document to insure compatability with current program needs.

The continuing implementation of the 3C process is focused upon the thirteen regional planning agencies that encompass all 351 communities in the Commonwealth. Within each of these regions, there has been formed a Transportation Policy Advisory Group (TPAG). Decisions for transportation improvements are made by the statutory State agencies acting in full partnership with Regional agencies as Metropolitan Planning Organizations (MPO's), but only after full consultation with these TPAG's. The Regional Planning Agency (RPA), the professional planning organization for each region, provides staff support to the MPO and to the TPAG. The regional liaison section of BTP&D coordinates the technical analysis and support functions of BTP&D with the efforts of the RPA staff. This coordination is reflected in the preparation and implementation of "unified work programs" for each region. Coordination of the planning activities of the several agencies involved in such areas as land use, environmental and economic development is handled by the Bureau's interagency planning studies unit, working with the Office of State Planning. Products of the 3C process are regional, corridor and locus planning studies based on BTP&D guidelines, as well as endorsed Long-range Plans and Transportation Improvement Programs in each Region.

Technical analysis and data management activities of the Bureau are carried on primarily through in-house work. The primary activities in this area are:

- on-going data collection and data management
- special Statewide planning studies, regional and sub-regional studies and corridor and locus studies
- on-going program development activities
- research

The continuing data collection and management activities include the updating of physical inventories and travel inventories. Field operations for the completion of the road inventory program were completed in 1975. In two related activities, the updating of Federal-aid urban areas by local officials in cooperation with RPA's and the Department was approved by the Federal Highway Administration (FHWA). Also, the statewide 1980 highway functional classification plan, upon which the new Federal-aid systems were realigned, were reviewed by local officials and RPA's in cooperation with the Department and approved by FHWA.

A major responsibility of the Bureau is to translate raw traffic count data into refined traffic movement estimates for design purposes. Travel (or operations) inventory updating include the traffic count program, truck surveys, origin-destination surveys, and the publishing of the Annual Traffic Volumes Report.

Statewide studies which either started or continued this year included studies of statewide transportation and comprehensive planning, bikeways, scenic roads and railroad network and right-of-way evaluation. Areawide studies included initiation of the Regional Planning Study for the Montachusett and Berkshire regions.

Continuing program activities include the preparation of various fiscal studies, implementation of a project information system and the development of a Statewide transportation capital improvement program.

During the year a Rural Highway Public Transportation Demonstration Project in Franklin County was developed with FHWA. This project will develop the technical, organizational and economic information to provide both public transportation and/or social services to persons in a rural area who do not have reasonable access to alternate forms of transportation and who are often deprived of mobility where public transportation is inadequate or non-existent.

The immediate priority of the Bureau is the fine-tuning of the relationship among the MPO's, RPA's, TPAG's and itself; specifically dealing with the question of how local, regional and State priorities are combined into plans and work programs.

Additionally, the BTP&D faces the challenge of broadening effective community participation in the TPAG. In adapting to the changes in emphasis of its responsibilities, BTP&D seeks to constantly improve its decentralized and open process and its products, rather than only responding to requests for technical information.

In this connection, a major responsibility of the Bureau in 1976 was the further basic reorientation of state and regional functional planning activities to integrate inter-disciplinary programs on a comprehensive regional and corridor planning study basis with multi-

modal transportation as an element in a total process including land use, economic, social and environmental factors. The reorientation was achieved in close cooperation with the Office of State Planning and has produced general regional and corridor planning study guidelines for use by all 3C agencies in performing tasks in regional unified work programs and two specific regional planning study designs and work programs for Berkshire (BCRPC) and Montachusett (MRPC). For other regions, within the regional planning study format, a corridor planning study emphasis is producing a series of issue-oriented studies which can be aggregated as areawide studies. During 1976 procedures were clarified and studies initiated. The continuing major thrust of the reorientation is integration of a variety of federally-funded programs (DOT-3C, EPA-208, HUD-701, EDA, etc.) and state counterpart activities to eliminate duplication and conflict, and thereby, improve productivity and utility despite the reduced commitment of personnel and resources required by current budget constraints.

The major achievements of the BTP&D during 1976 are summarized below:

1. The development of a preliminary draft of Highway Priorities.
2. The development of a Project Information System
3. Significant improvements to the statewide traffic counting programs
4. Revision of Status Report on Transportation Planning
5. Completed study of the impact of the construction of highway on a community

6. Completed collection and submission of data to the FHWA on the National Highway Inventory and Performance Study (NHIPS)

7. Completed tabulation and analysis of a bicycle survey in Essex County as part of the State's first bikeway project funded by state and federal funds. Bikeway plans and programs are being developed in other regions

8. Completed three and initiated several other corridor planning studies in cooperation with the regional planning agencies

9. Regional planning studies begun in two regions

10. Development of Technical and Administrative Guidelines for transportation planning

11. Publication and distribution of new highway regional series maps

12. Regional and Statewide Networks

13. Completed realignment of the Federal-aid highway systems based upon the approved Federal-aid urban areas and functional classification plans as required by the Federal-aid Highway Act of 1973.

14. Completed coding, keypunching and processing of highway inventory data and planning the data in computer files and made distribution to Department, local officials and RPA's.

15. Continued active participation in programs established by the Office of State Planning to integrate state agency planning on a comprehensive basis including RPS (5) and in other 208, CZM, 701, etc. activities

16. Completed various U. S. DOT mandated data collection efforts and reports

17. Completed the highway phase of the 1976 National Transportation Study

18. Completed the data requirements phase of the Urban Systems Study required by FHWA

19. Completed the U.S. DOT - AAR Railroad Inventory Study

The following reports were produced:

1. Recommendations for a Long-Range Systems Guide for Transportation Planning in Massachusetts

2. Highway Fiscal Planning and Needs Analysis

3. Local and Intercity Transit - State and Federal Policy and Funding

4. Local Road and Street Finance Report

5. Planners' Manual

6. Resource Management Policy Council, 1972-74 and Transportation's Need for a Comprehensive Planning Base

7. 3C Planning Collaboration

8. Citizen's Handbook: Your Guide to the 3C Transportation Planning Process in Massachusetts

9. Citizen Involvement Manual - Public Involvement Through Prescriptive Planning with an Annotated Bibliography

10. Trails and Bikepaths

11. Scenic Highways Planning

12. Data Systems in Other State Agencies

13. Traffic Operations Inventory Systems

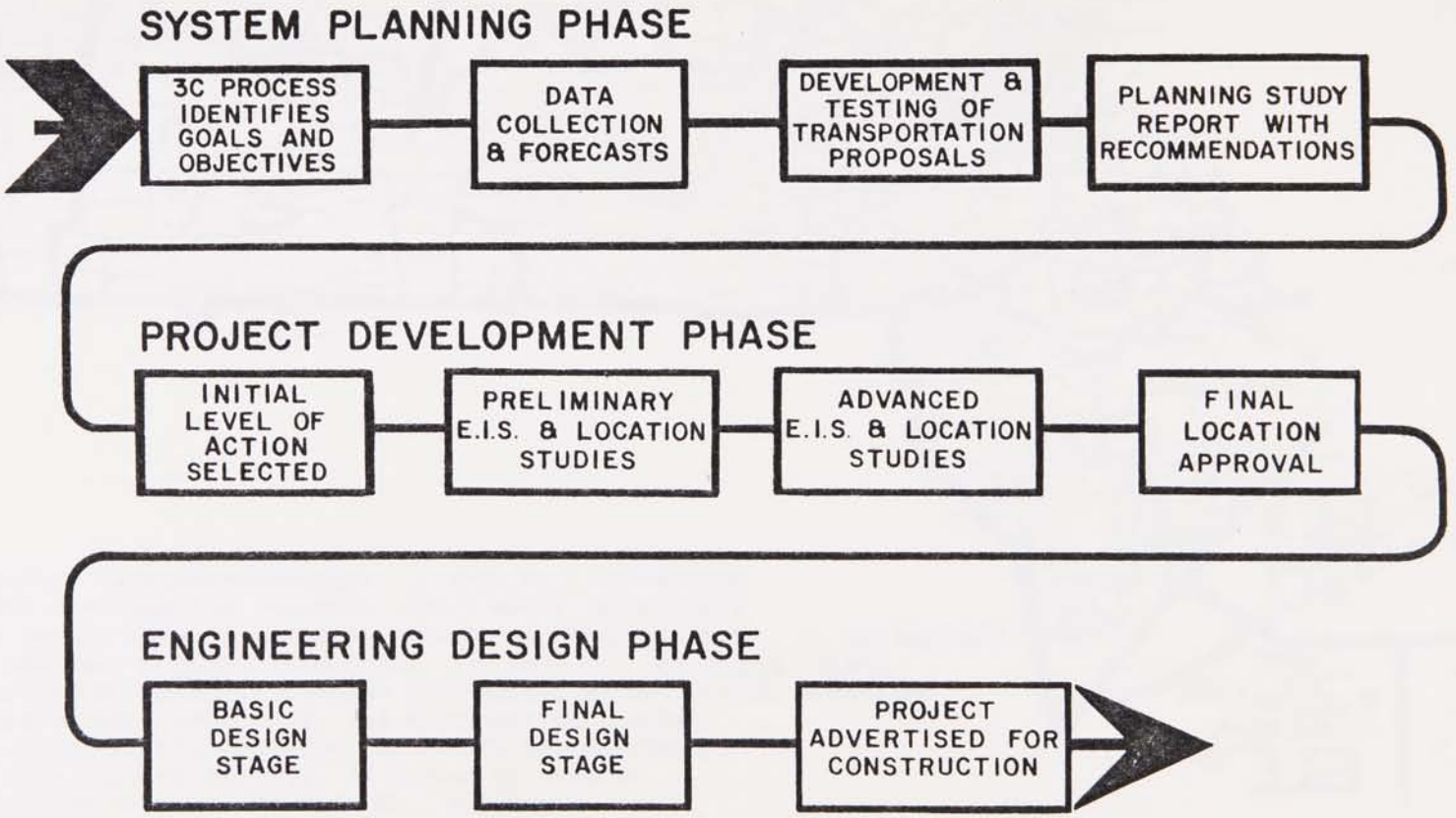
14. Computer Assisted Analysis of Geographic Information for Transportation Planning

15. An Economic Base Analysis of the Fitchburg-Leominster Region

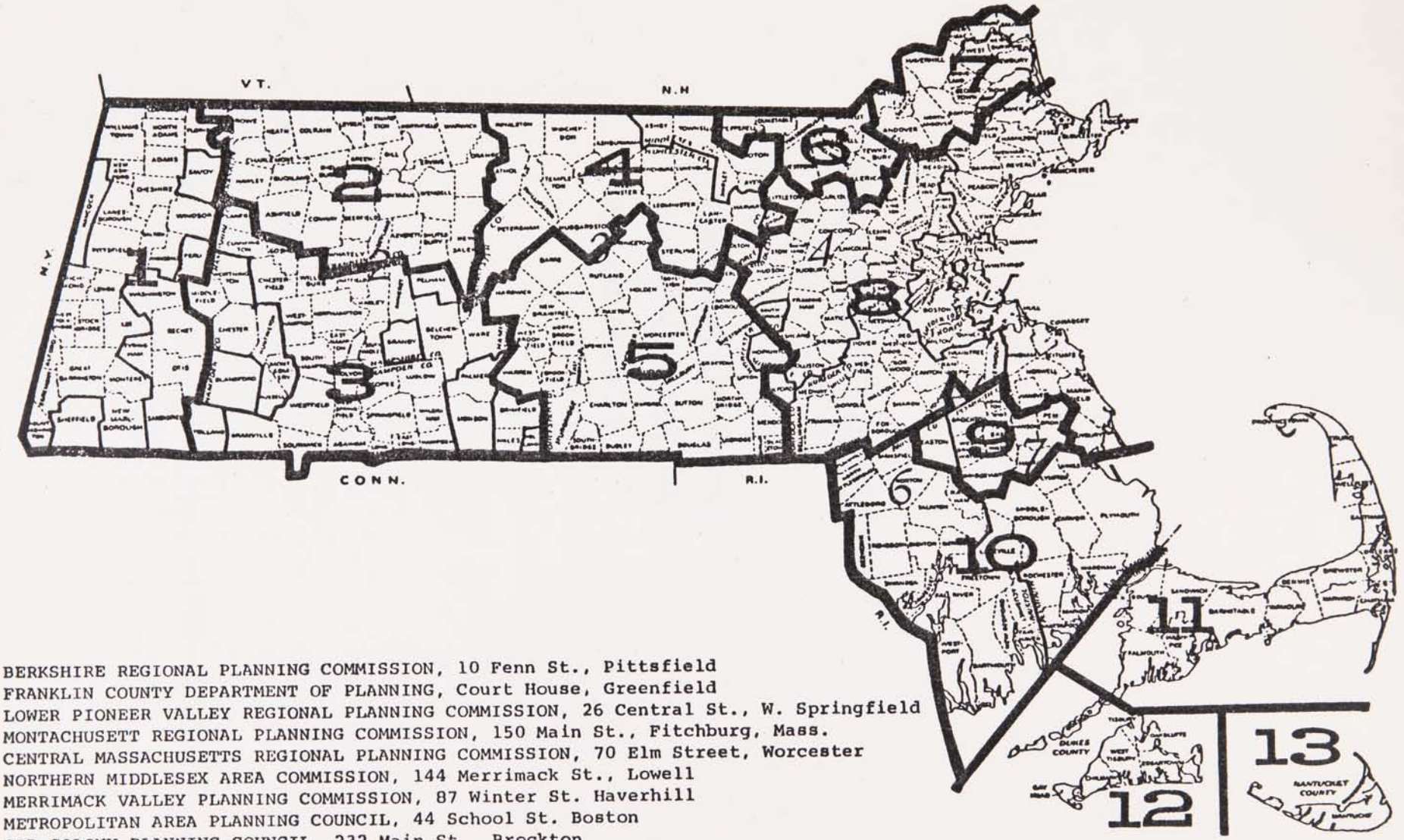
16. Transportation Funding Primer

17. Roadside Rest Facilities Planning

STEPS IN THE DEVELOPMENT OF A TRANSPORTATION PROJECT IN MASSACHUSETTS



MASSACHUSETTS REGIONAL PLANNING AGENCIES



1. BERKSHIRE REGIONAL PLANNING COMMISSION, 10 Fenn St., Pittsfield
2. FRANKLIN COUNTY DEPARTMENT OF PLANNING, Court House, Greenfield
3. LOWER PIONEER VALLEY REGIONAL PLANNING COMMISSION, 26 Central St., W. Springfield
4. MONTACHUSETT REGIONAL PLANNING COMMISSION, 150 Main St., Fitchburg, Mass.
5. CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION, 70 Elm Street, Worcester
6. NORTHERN MIDDLESEX AREA COMMISSION, 144 Merrimack St., Lowell
7. MERRIMACK VALLEY PLANNING COMMISSION, 87 Winter St. Haverhill
8. METROPOLITAN AREA PLANNING COUNCIL, 44 School St. Boston
9. OLD COLONY PLANNING COUNCIL, 232 Main St., Brockton
10. SOUTHEASTERN REGIONAL PLANNING AND ECONOMIC DEVELOPMENT DISTRICT, 7 Barnabas Rd. Marion
11. CAPE COD PLANNING AND ECONOMIC DEVELOPMENT COMMISSION, First District Court House, Barnstable
12. DUKES COUNTY PLANNING AND ECONOMIC DEVELOPMENT COMMISSION, Oak Bluffs, Mass. P.O. Box 1447
13. NANTUCKET COUNTY REGIONAL PLANNING COMMISSION, Town and County Building, Nantucket

BUREAU OF PROJECT DEVELOPMENT

Location Section

Geodetic Section

Photogrammetric Section

Environmental Section

Special Projects

BUREAU OF PROJECT DEVELOPMENT

The Bureau of Project Development is responsible for transportation projects and related activities after the Bureau of Transportation Planning and Development has assigned priorities to them under their "system planning phase". Its work continues the "3C" planning process, a continuing, cooperative and comprehensive effort, using full citizen participation to develop projects from preliminary engineering through basic design, complying with applicable Federal and State environmental laws.

The Bureau is responsible for the study of transportation alternatives within a corridor location. It develops the various alternatives within the corridor using the "no build" option as a basis for comparison.

The Bureau prepares preliminary plans and profiles with cost estimates, and develops the socio-economic and environmental impacts for each alternative. The study produces a "recommended alternative" and a Draft Environmental Impact Statement. After a Public Hearing, if the project does not have major opposition, a Basic Design Report is completed with a Final Environmental Impact Statement. The project, if approved by Federal and State officials, then can proceed into the Final Design phase.

The Bureau has four major sections:

(1) Location and Surveys

(2) Geodetic and Photogrammetric

(3) Environmental

(4) Special Projects

The joint effort of the four sections provides the tools to complete the project development phase of transportation projects.

LOCATION SECTION

This section prepares location studies and follow up with the organizing, preparing and conducting of Public Hearings, Public Meetings and Workshop Sessions throughout the Commonwealth.

This section has prepared various schemes to depress the Central Artery. Those involved in this study will soon form a special task force concerned with an in-depth study, and a greater degree of specifics.

There are several location studies being conducted by this section in addition to Consultant studies. Consultant contracts are under the supervision of this section. These contracts pertain to various study phases of proposed construction or re-construction of state or inter-state highways. The approximate cost of these contracts is $2,000,000 with possible construction cost of well over $200,000,000 excluding Right Of Way costs.

Unique concepts are being explored for multi-model transportation such as: Alewife Brook Parkway examines concepts for combining highways, transit, and commuter rail, while allowing for extensive park improvements including bicycle and pedestrian paths in cooperation with M.D.C. South Quincy-Braintree study looks at direct access from the major highway network to the Transit Station to determine their integration capabilities.

The Central Artery utilizes an extensive tunnel section for main vehicular line traffic and includes a new tunnel section for rail between North Station and South Station. A possible third harbor tunnel can extend to serve Logan Airport. Park and community benefits will be derived from utilization of the surface area above the tunnel.

GEODETIC SECTION

The Geodetic Survey Section of the D.P.W. is responsible: (1) for the densification and maintenance of the horizontal and vertical survey control nets in the Commonwealth, (2) perambulation of the boundary of the Commonwealth, (3) drafting legislative bills proposing changes in town boundaries, (4) cooperating with the National Geodetic Survey and United States Geological Survey in projects of mutual benefit, (5) providing survey control data to public and private agencies and individuals.

Field Data Acquisition (Triangulation Traverse Levels)--30%

Mark Maintenance----------10%

Reconnaissance----------30%

Setting and Dieing New Station----------10%

District and Boston Office Special Projects----------20%

Dissemination of Data to Public----------25%

Survey Adjustments Computer----------20%

Abstracting and Coding Field Data----------15%

Maintenance of Geodetic Data File----------15%

Addition of new control to file and plot----------10%

Computer Program Modifications----------10%

Overhead, paperwork, technical reports, etc.---------- 5%

Field Work	Time
Reconnaissance	30%
Field Measurements	30%
District and Boston Office special Projects	20%
Mark Maintenance	10%
Setting and Describing New Stations	10%

GEODETIC SECTION

Office Work	Time
Dissemination of Data	25%
Survey Adjustments in computer	20%
Abstracting and coding field data	15%
Maintenance of Geodetic data file	15%
Addition of new control to file and plots	10%
Computer Program modifications	10%
Overhead, paper work, technical reports, etc.	5%

The cooperation of districts, private surveyors and engineers in reporting condition of monuments continues to improve. It would require an additional 3 men full time to provide the section with this valuable information.

During Fiscal 1973, while the section worked with the National Geodetic Survey, new techniques for the rapid, efficient and economical establishment of new control were learned. This year fully half of the field work was devoted to establishing new monumentation by this method.

During the year, the Massachusetts-Connecticut State Boundary was perambulated in cooperation with the Connecticut Geodetic Survey/

PHOTOGRAMMETRIC SECTION

The Photogrammetric Section is responsible for obtaining and furnishing aerial photographic and photogrammetric information for highway and highway related studies.

This responsibility covers the solicitng of proposals for aerial photogrammetric survey projects, negotiation aerial photogrammetric survey contracts, preparing such contracts for Departmental processing and approval, overseeing the performance of such contracts, approving billings for payments on such contracts, recommending approval of contract completion reports, and any other work required on such contracts. Also recommendations are made as to the type and best scale for specific aerial photogrammetric surveys, so as to obtain the optimum information needed for the project. Assistance is also given, whenever necessary, on generalized photographic interpretation of aerial photography.

There were only three aerial consultant contracts initiated during the year for photogrammetric topographic survey plans and one aerial consultant contract initiated for state wide aerial photographic services on an as needed basis.

One photogrammetric topographic survey contract was for plans at a scale of 1"=20' with 1' contours in Lowell, covering an aera of 0.314 square miles including Thorndike-Fletcher-Dutton Streets and Lord Street Overpass-Tower Corner, at a total lump sum cost of $21,179.00.

The second photogrammetric survey contract was for plans, profiles, construction plan and profile tracings, and cross-sections at a scale of 1"=40' with 2' contours, to provide additional coverage and complete work begun under a previous contract, covering an area of 9.21 square miles in West Boylston-Holden-Sterling for Interstate Route 190, at a lump sum cost of $91,275.00.

PHOTOGRAMMETRIC SECTION

The third photogrammetric survey contract is for plans at a scale of 1"=40' with 1' contours, plans at a scale of 1"=40' without contours, reductions of both these sets of plans to 1"=100', a photo mosaic in three sections at a scale of 1"=150', and a high order ground control survey with permanently marked horizontal and vertical stations, for engineering and environmental studies for the possible depressing of the Boston Central Artery, covering an area of about 2.12 square miles at an estimated cost of $227,000.00. This project is still being negotiated.

There were enlargements purchased of 103 aerial photographs, furnished in the form of screened cronaflex positive transparencies, covering a total area of about 124 square miles (79,360 acres) for use in various engineering and environmental studies and at a cost of $1,800.00.

Numerous telephone inquiries were received concerning both general and specific photogrammetric information. Most of these inquiries were about the availability of aerial photography and the scale of the photography, both in the photogrammetric section and in other locations. There were, also, numerous office visitors who were interested in viewing the aerial photographs we have on file and in obtaining information on how to get copies of selected aerial photographs.

Aerial photographic prints, mostly of our 1:7200(1"=600') statewide aerial photographic coverage, were loaned to various departmental personnel, departmental consultants, and other state governmental agencies. About 2870 photographs were loaned, covering a total area of about 3000 square miles (1,920,570 acres).

Copies of about 950 aerial survey plans at scales of 1"=200', 1"-100' and 1"=20' were furnished to departmental personnel, departmental consultants and various other governmental agencies. A total of 174 separate requests were received for these plans, which covered a minimum of 3000 square miles (1,920,000 acres).

PHOTOGRAMMETRIC SECTION

At the request of the United States Department of the Interior, Fish and Wildlife Service, Boston Regional Office, the Photogrammetric Engineer served on a U.S. Fish and Wildlife Selection Committee for the selection of an aerial survey consultant to furnish 1:2500 scale aerial photogrammetric survey plans for a project to map various wetland areas adjacent to Lake Champlain in the States of Vermont and New York.

ENVIRONMENTAL SECTION

During the past year one (1) Draft E.I.S. and two (2) pre-drafts were circulated as follows:

Draft: Berkley-Dighton Connector

Pre-draft: Route 20 Springfield-Wilbraham

Route 146 Sutton-Uxbridge-Mulville

One (1) Final E.I.S. was approved during 1976, and five (5) pre-finals were submitted.

Final: Chicopee-Holyoke I-391

Pre-final: Task A North Shore Study

Task B North Shore Study Vol. I

Task B North Shore Study Vol. 2

Route 25 Wareham, Plymouth, Bourne (North and South of Cape Cod)

Federal Highway for Review

Also 75 Environmental Assessment Forms (E.A.F.) for the Department of Public Works were processed through the Environmental Section.

The section also acts as a reviewing agency for the E.A.F.'s and E.I.R.'s submitted to E.O.E.A.

The Environmental Section conducts an inter-agency monthly meeting to discuss environmental issues of mutual concern. This meeting is primarily intended to be project and agency oriented, but guest speakers also address pertinent and timely issues.

A monthly meeting is held with District Environmental Engineers and other Engineers on specific subjects, projects and problems.

The Environmental staff presently consists of 14 members trained in mathematics, economy, social psychology, architecture, civil engineering and archaeology.

ENVIRONMENTAL SECTION

Courses Attended:

One staff member attended a course in Community Involvement in Highway Planning and Design, sponsored by F.H.W.A. in Boston during October, 1975.

One staff member attended a course in Environmental Workshop, sponsored by F.H.W.A. in Cranston, Rhode Island during November, 1975.

One staff member attended a course in Conservation Seminar, sponsored by Mass. Association of Conservation Commissions in Worcester during March, 1976.

One staff member attended a course in Public Land Management and Ponding Seminar, sponsored by Department of Environmental Management in Boston during June, 1976.

Effective November 29, 1974, a new issuance of PPM-90-1 published as FHPM-7-7-2, provided improved guidelines in the preparation and processing of E.I.S.'s. One of the most important aspects of the guidelines being the definition of a major and non-major action.

The determination of a major action requires the preparation of an E.I.S. or Negative Declaration. The determination of non-major action allows certain types of action to be excluded from full E.I.S. development.

The Action Plan is currently being revised so that it will be simplified and will improve the public's participation process.

The Section is becoming more involved with other divisions in the Department, expanding services to include construction, maintenance and traffic operations.

SPECIAL PROJECTS

The Special Projects Section of the Bureau of Project Development functions in a staff relationship with the other section in addition to its line function of carrying forward long-range planning alternatives. As described in the 1974 Action Plan, Project Development fills the need to eliminate redundart studies and to narrow alternative options to the most feasible and attainable solutions acceptable for Design and Construction.

During the year, the Special Projects Section negotiated and supervised contracts and studies in such diverse project areas as: bridges (new and reconstructed), carpooling, demolition, fringe parking, joint use of highway and transit facilities, area transportation studies, area parking studies, air quality assessments, acoustic impact studies, highway aesthetics, use of railroad right of way and bicycle paths.

In the field of public relations, the Special Projects Section has been a source of guidance to the student population of our local colleges, various public interest groups and public agencies in current data relation to transportation development plans and completed projects. This activity, during the year involved responses to more than 150 inquiries.

The Special Projects Staff of 5 engineers administered the following projects:

1. Boston Metropolitan Parking strategy - Contract #16277 Wilbur Smith Associates. Requests for Final Report are still b being mailed to various people and agencies throughout the

country. Also in the process of preparing documents for final payments.

2. Feasibility Study of Depressing the Central Artery - Contract #17568, Boston Redevelopment Authroity - Final Draft Report was submitted to the Department and contract was closed out in December 1975.

3. Transportation Issues for the Park Plaza Renewal Project Contract #18537 - Justin Gray Associates. Final Report was submitted to the Department and contract was closed out February 1976.

4. Beautification and Environmental Enhancement of I-93 Medford-Somerville-Boston. Contract #17921 - Justin Gray Associates - Cavanaugh Copley Associates and Richard A Gardnier Associates. Final Report was submitted to the Department in March 1976.

Also the Report included final landscaping plans for I-93. The landscaping project is currently under construction. Also in the process of preparing documents for final payment.

5. Prepared property boarding contract for various properties in the Southwest Corridor.

6. Assisted the U. S. Department of Transportation through the Transportation Systems Center in obtaining the necessary permits and documents for erecting a temporary test sound barrier wall adjacent to I-93 in Andover.

7. Transportation Improvements for the S. W. Corridor. Contract #18274 - Frederic R. Harris, Inc.

Interagency Contract with the MBTA for preparing the Environmental Impcat Analysis for the proposed Relocation of the Orange Line and proposed Arterial Street.

The Environmental Impact Analysis has been completed and the Public Hearing was held in July 1976.

8. S. W. Corridor - Completed areas for land payment to FHWA relative to land acquired for I-95 South and land needed for the Relocation of Orange Line and Arterial Street.

9.Salem-Peabody

Task A Route 128 Improvements worked on preparation of final EIS.

Task B - Salem-Peabody Connector - September 1975 Public Hearing on Draft EIS - Preparation of Final EIS and Basic Design in process.

Task C - Draft Environmental Impact Statement received.

10. Quincy - Braintree

Final EIS received, reviewed and approved. Design Contract letter to Parsons, Brinckerhoff, Quade and Douglas - in process of finalizing contract.

Upland Road Extension - Location Report for Review.

Lowell Towers Corner - Prepared Right of Way plan for taking.

11. Waltham - Main Street By-Pass Study - Contract #17476 Terminated November, 1975 due to local opposition.

12. Northern Avenue Bridge - Basic Design Study - Contract #16679 - Negotiating license permit with Coast Guard still pending.

13. Demolition of Building on Southwest Corridor - Contract written and advertised March, 1976

14. Negotiating contract with consultant for Project Development Report for bridge carrying Route 116 over Connecticut River between Holyoke and South Hadley.

i4. (cont.)

Negotiating contract with consultant for Project Development Report for bridge carrying Route 3A over North River between Scituate and Marshfield and bridge carrying Route 6 over Wareham River in Wareham.

15. Revere Beach Connector - Contract #15084 - Project Development Report.

16. Salem - Beverly Connector - Task B - Contract #14758 Also Kelly

17. Lexington-Hartwell Avenue Connector - Contract #14606.

18. Goodwin Circle - Peabody - Study for Ramp Modifications.

19. Route I North Upgrade - Proposal Negotiation

20. Various Demolition Projects in Southwest Corridor.

21. Wellington MBTA Joint Use Feasibility Fringe Parking Study - Contract #18098 - Sasaki Associates

Interagency Study to provide base data for Development of major transit terminal on "T" Orange Line. Project completed February 1976, City of Medford now actively investigating site for marketability to private developers.

22. Fringe Parking Feasibility - 5 Locations - Metropolitan Boston - Contract #18075 David A Crane Partners, Inc. Approximately 90% complete. Findings incorporated in S. W. Corridor Forest Hills Project and Route 128 R.R. Station. 2 sites tentatively recommended No-Build - (Community College, Charlestown on "T" Orange Line and Weston on B & M at Route 20 - 128 intersection).

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HIGHWAY ENGINEERING DIVISION

Bridge Section

State Aid

Highway Engineering Division

This Division's basic goal is to perform the diverse engineering functions necessary to convert a concept into a set of working construction plans, specifications and estimate. These items constitute our end product, from which the highway transportation network is built.

Projects involved range all the way from Interstate highways through intermediate roadways, to safety projects, resurfacing and bicycle paths.

This particular year has seen heavy concentration on the safety upgrading of existing Interstate Routes. Our usual ration of reconstruction, localized improvements, fencing, specialized projects and review and processing for advertising of documents prepared by other Divisions have taken a large part of our effort.

Environmental and social impacts continue to receive detailed consideration, and interaction with design issues has had its impact on the design itself.

As completion of the Interstate System draws closer each year, it appears that future year-by-year efforts will be geared to two major classifications: first, safety, which will take many forms from removal of the thousands of existing roadside obstacles to further upgradings, and second, an effort to improve the traffic handling capabilities of existing facilities as well as to protect the integrity of the highway network that now exists.

BRIDGE SECTION

The Department of Public Works is the owner of approximately 2550 bridges in the Commonwealth of Massachusetts. They vary in size, type, age and condition, from a stone arch built more than 200 years ago in Ipswich to a mile long structure spanning the Taunton River.

In addition to the DPW owned bridges, there are 2800 bridges under the ownership of cities and towns.

During the annual report period extending from July 1, 1975 to June 30, 1976, the Department advertised for bids for construction or reconstruction of 22 bridges and 11 walls, and for the improvement of 7 structures, at a total structural cost of $14,773,000.

These structures are located in 17 cities and towns throughout the Commonwealth, and their total structural cost was distributed to the following categories:

Federal Aid	$ 12,052,000
Non-Federal Aid	
State Highway	1,545,000
Substandard Bridges	646,000
Maintenance	456,000
State Aid	74,000
	$ 14,773,000

The major projects which were advertised for construction and bids received during the current year were the following:

Rte. 3	Braintree - 1 bridge	$ 99,000
Rte. 202	Granby - 1 bridge	141,000
Rte. 1	Newburyport - 1 bridge	847,000
I-95	Peabody - 1 bridge and 1 wall	1,145,000
Rte. 3A & Rte. 113	Tyngsboro - 1 bridge improvement	799,000
I-190	Worcester & W. Boylston - 7 bridges & 9 walls	9,108,000

The cities and towns in which the remainder of the structures for which bids were received are:

Attleboro	$235,000	1 bridge
Boston	403,000	2 bridges, 1 bridge improvement
Braintree	74,000	1 bridge
Brockton	262,000	2 bridges
Dedham	406,000	2 bridges
Leominster	83,000	5 improvements
Malden	62,000	1 wall
North Adams	214,000	1 bridge
Somerville	599,000	1 bridge
So. Hadley	296,000	1 bridge
Williamstown	136,000	1 bridge

During this annual report period preliminary engineering design has been initiated for the following projects:

Andover		1 bridge
Boston		7 bridges
Bridgewater		1 bridge
Chester		"
Easton		"
Fall River		"
Fitchburg	Rte. 31	"
Methuen		"
Middleboro		"
Natick		"
Salisbury	Rte. 110	"
Shrewsbury-Worcester	Rte. 9	"
Stockbridge		"
Walpole	Rte. 27	"

The Bridge Section has been involved with the checking of the designs and the checking of shop drawings for various traffic sign contracts.

Within the Bridge Section we have the Metals Control Unit which is a multifaceted engineering service group. Its primary purpose is to provide a system for inspection and quality control that will guarantee the structural integrity of bridges that are to be incorporated into the State Highway System.

In addition, it provides the following engineering support functions:

1. Educational programs geared to keep Bridge Design personnel, Construction Engineers, Maintenance Engineers and other related groups informed as to the current state of the art in fabrication, welding, nondestructive testing and applied metallurgy.

2. Acts as consultant to engineering groups both within the Department and to other agencies and authorities such as the MBTA and Massport. Also assists private consulting engineers and inspection firms engaged in or contemplating doing work for public and quasi-public agencies.

3. Reviews for Department supplier approval, the manufacturer's Quality Assurance Program. When approval is granted the Unit provides monitoring of the Program through intermittent or full time inspection service as required.

4. Serves as engineering appelate authority as noted in AWS, ASME, ASTM and other specifications relative to structural fabrication.

5. Develops and promulgates specifications for Ultrasonic Inspection, Radiography, Welding Procedures and Fabrication.

6. Upon request supplies inspection and engineering service to the Construction Section for field welding, bolting and erection of structures.

7. Lectures on quality control procedures and methods with special emphasis on Engineer-Manufacturer relationships in the public sector.

The rating of bridges to determine the safe allowable load is one of the tasks of the Bridge Section. During this annual report period, 106 bridges have been rated.

The Department continues to receive requests from utility companies to place utilities on existing bridges. Also requests for permits to move overweight loads over bridges. In each case the bridge involved is analyzed structurally to insure that the safety of the public is not jeopardized by permits issued by the Department.

The Bridge Section also investigates damage and develops repair procedures for bridges damaged by trucks impacting superstructures or by fire.

Checking the stresses on structures which result from adding deck overlays to bridge decks is also a function of the Bridge Section.

STATE AID

The Annual State Aid Highway allocations for Fiscal 1976 for all 351 municipalities amounted to $13.5 million dollars, the same as for Fiscal 1974 and 1975. These funds have to be used for construction, reconstruction or improvements projects under Section 34, Chap. 90 of the General Laws and in accordance with the policies set forth by the Department. Funds made available from Chapter 497 of the Acts of 1971, and further amended by Chap. 492 of the Acts of 1974 (1¢ gas tax), amounted to approximately $24 million dollars. The funds are utilized for any highway purpose and are now being distributed on a semi-ammual basis. In December of 1975, funds made available from Sections 1 and 4 of Chapter 825 of the Acts of 1974, were distributed by check to the 272 municipalities ($10 million) outside the MBTA District and to the 50 municipalities ($1.25 million) on the "fringe area" of the BMTA District. These funds also have to be used for a highway purpose. Section 3 of Chap. 825 proposed to allocate $25 million to the 272 communities but was reduced to approximately $18.5 million in accordance with Section 9 of said Act and the funds could be used for any purpose.

This year, the Department was very successful in having Chapter 88 of the Acts of 1976 enacted into law. This very improtant piece of Legislation authorized counties to spend monies appropriated during one fiscal year in another fiscal year for highway purposes. This, in effect, released millions of dollars

of State Aid Chapter 90 Funds, allocated during the 1963 to 1972 era, for construction, reconstruction and improvement type projects.

LOCAL TRANSPORTATION AID TOTALS

(Statewide in Millions) *Estimates

Highway Aid	1972	1973	1974	1975	1976
Local Highway and including chapters 81 & 90	10.75	13.5	13.5	13.5	13.5
One cent on gasoline tax	31.4	23.1	23.1	23.1	23.1
Local highway aid Non-MBTA communities	—	—	40.0	45.0	18.5
Local highway aid MBTA fringe communities	—	—	2.5	2.5	2.5
Subtotal Highway Aid	42.15	36.6	79.1	84.1	57.6
Transit Aid					
MBTA	18.8	19.3	54.3	64.6	73.5
Non-MBTA	—	—	1.5*	2.0*	2.0*
Subtotal Transit Aid	18.8	19.3	55.8	66.6	75.5
Total Transportation Aid	59.95	55.9	134.9	150.7	133.1
Selected Communities** (IN THOUSANDS)					
Boston	5,128.3	14,471.3	27,902.3	31,704.3	32,704.1
Worcester	1,369.7	1,983.5	2,529.4	2,526.3	2,050.0
Springfield	1,960.8	2,380.8	2,457.2	2,450.4	2,121.9
New Bedford	870.0	1,066.0	1,492.1	1,490.1	1,248.9
Pittsfield	448.9	665.6	957.3	955.5	696.8
Fitchburg	339.6	510.4	733.6	733.2	514.8
Lowell	694.2	847.3	1,258.3	1,259.6	1,196.5
Cambridge	1,455.5	1,441.6	3,847.3	4,347.3	4,672.3

**Includes Transit Aid

RIGHT OF WAY BUREAU

RIGHT OF WAY BUREAU

RELOCATION PLANNING

The Relocation Planning Section regularly works with Department Environmental Engineers, Project Expediters, Location and Design Personnel, as well as consultants to the Department in developing highway alignment and design alternatives to advise on certain social and economics effect of the proposed facilities, including impacts on families and businesses to be displaced, employment and tax loss, effects of business displacement, possible disruption to neighborhoods and local trade, and the relocation of established families and businesses. Over 56 projects were actively worked on during Fiscal Year 1976. In addition Conceptual Stage Relocation Plans were prepared for 10 projects which could have involved the displacement of as many as 220 families and 54 businesses in the various alternatives. Right of Way Stage Relocation Plans were prepared for 8 projects and 28 Right of Way Stage Relocation Plans were developed for submission with requests for hardship acquisitions.

PROJECTS

During Fiscal Year 1976, the Right of Way Bureau Project Section worked on some 390 cases, involving about 36 cities and towns. The work that is carried out by the Project Section includes the establishment of property ownership, securing real estate tax assessment, conducting property interviews with owners and tenants, preparing property reports, and investigating complaints such as reports from abutting property owners of contamination to their wells from road construction activities.

Land and easement takings were made in connection with Interstate, ABC, Safety and Urban Systems Projects. Real Estate takings were also made with respect for maintenance sites, rest areas, drainage betterments, construction, drainage and other types of easements.

The Right of Way Project Section also monitored Right of Way acquisition by cities and towns in connection with Federally-aided Urban Systems Projects. By reviewing procedures of municipal taking agencies, it stood in the position of being able to certify to the Federal Highway Administration that acquisition, appraisal and relocation procedures were carried out in compliance with Title II and/or Title III, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

CONVEYANCING

During Fiscal Year 1976, this section was assigned 435 full title examinations and 155 rundown examinations to fee conveyancers and in addition 64 full title examinations and 197 rundown examinations to staff. Takings for 72 projects consisting of 276 cases were filed for recording in the various Registries of Deeds including required formal service of notice to City and Town Officials and County Commissioners. Individual land damage case files were prepared including the preparation of invoices and all other required legal documents. Negotiations were carried on with mortgagees and other lienholders to secure releases and in those cases where there were other legal impediments to Payment of the Award, owners or their attorneys were seasonably advised as to what legal steps would be necessary to clear the title. During this period a total of 233 cases consisting of 21 final releases and 212 Pro Tantos were paid. A total of 43 checks were retrieved from the Eminent Domain Trust Fund and paid to owners.

This section handled and processed 102 Court Judgements in the total amount of $3,032,743.22 over and above the Pro Tanto Payments settled in the following manner:

17 Jury Verdicts totalling	$ 484,759.22
31 Finding of the Court and Agreements after Findings	1,511,499.65
23 Orders for Judgement totalling	743,065.50
31 Agreements for Judgement	293,418.85

The processing of these Judgements involved the following procedures: Conferences with the Attorney General prior to settlement, verifying title ownership and removal of encumbrances, insuring full compliance with Federal regulations checking calculations and credits for Pro Tanto Payments, replacement housing and rent owed, establishing the availability of funds, invoicing and final delivery of check to the Attorney General. 21 Petitions for new Certificates of Title were filed with the Land Court involving Registered Land.

NEGOTIATIONS

During this period, the bulk of the Department's offers of fair market value made by the Right of Way Negotian Section involved takings made in connection with I-190 construction in Worcester, West Boylston, and Leominster; Route 33 construction in Chicopee and South Hadley; the Florence Street Extension and Route 60 in Malden; I-495 in Norton; the reconstruction of the Walnut Street Bridge and other miscellaneous topics and safety projects throughout the state.

A breakdown of the Negotiation Section's activities is as follows:

A.	Offers of Fair Market Value	407
B.	Drainage Taking Agreements	2
C.	Rent Supplement Letters delivered and explained	202
D.	Replacement Dwelling Letters delivered and explained	64
E.	Use and Occupancy Reports	232
F.	Land Damage Agreements including Special Damages	13
G.	Rights of Entry	6
H.	Buy Back Reports	9
I.	Sell Back (Southwest Corridor) Solicitations	25

In the Fiscal Year 1976, the Negotiation Section settled 7 of 12 new claims for damages incurred as a result of I-93 construction in Somerville.

The Negotiation Section was also involved in the obtaining of pro tanto receipts and releases for the purpose of processing unpaid checks for payment. A total of 109 calls were made and 45 pro tanto receipts was obtained during the fiscal period.

Offers to sell back properties taken in conjunction with the proposed Southwest Corridor were solicited from 25 former owners and present tenants. The Negotiation Section in collaboration with the Propery Management Section and the Office of the Southwest Corridor Development Coordinator has obtained agreements to purchase from 20 owners and tenants.

RELOCATION

Replacement housing additives were computed for 46 residential owner-occupied families and Rent Supplement additives were computed for 125 residential occupants.

During Fiscal Year 1976, land takings affected 123 families and 31 businesses and in this period, 139 families were relocated and 8 businesses moved to new quarters.

There were 209 moving cost claims, both residential and business which were processed during the Fiscal Year involving a total amount of $193,170.00 replacement housing allowance claims totalling $309,002.00 (average $6,717.00), 125 rent supplement claims totalling $330,875.00 (average $2,647.00), and 190 dislocation allowance claims totalling $37,200.00 (average $195.00). A total of 572 business and residential relocation claims were processed in Fiscal Year 1976, and the total family and business relocation cost was $895,248.00.

Relocation services rendered by the Boston Redevelopment Authority, Malden Redevelopment Authority, and the Worcester Redevelopment Authority as Contract Agents reflected a fiscal outlay of $699,887.00.

In addition because of the requirements of the 1970 Uniform Relocation Act, relocation plans were required for all projects and they were prepared by Department personnel. The level and priority of relocation assistance has been given added emphasis and these requirements have resulted in an upgraded relocation section consisting of 22 Department relocation staff workers and the above voted contracts with the Boston Redevelopment Authority, Worcester Redevelopment Authority, and the Malden Redevelopment Athority to carry out the relocation responsibilities of the Department in this area.

ADVANCE ACQUISITION AND FUNCTIONAL REPLACEMENT

The Advance Acquisition Section processed 25 cases for acquisition in the Fiscal Year just ended.

These cases included an exchange of State owned land (The Registry of Motor Vehicles, Worcester Branch) valued at $500,000.00, three business properties with a total estimated value of $755,000.00 and twenty residential property and one parcel of vacant land with a total estimated value of $658,000.00.

The functional replacement of the City of Worcester's school, and the Registry of Motor Vehicles and the Greendale Branch of the YMCA in Worcester are under agreement. The total value of these three functional replacements have been estimated to be 7.5 million dollars of construction, subject to credits for Pro Tanto Payments of about $3,000,000.00.

There are twenty five cases now pending in various stages of completion, among which two are archaeological sites and three that will result in functional replacements. The Archaeclogical Site Acquisition Program started this past fiscal year.

During this past fiscal year an estimated total amount of $1,913,275.00 for land damages was authorized for 35 parcels from 25 owners.

PROPERTY MANAGEMENT

Property Management activities of the Bureau were extensive during Fiscal Year 1976 as can be seen from the following figures.

During the year Fiscal 1975, rentals under Property Management Section of the Right of Way Bureau grossed $303,247.00 with a net income after expenses of $175,329.00. Sales of principal structures and improvements yielded $662,384.00 and sales of land brought $26,750.00. Parking area leases produced $29,382.00.

Additional leases netted $267,675.00 bringing the total net receipts to $1,161,520.00 for fiscal 1976.

During the year, 71 structures were acquired of which 58 were residential and 13 were commercial.

During the same year, 84 were vacated and 98 structures were released for demolition.

Comparison for Fiscal	1975	1976
Grossed Rental Income	305,297.	303,247.35
Net Income after expenses	186,842.	175,329.11
Sales of Structures	52,872.	662,384.25
Sales of land	2,800.	26,750.00
Parking area leases	1,053.	29,382.00
Additional leases	193,363.	267, 675.21
Total Net Income	436,930	1,161,520.57

No. of Structures acquired - Residential (58) - Commercial (13)

No. of Structures vacated - (84)

No. of Structures released for demolition (98)

ATTORNEY GENERAL LIAISON

The following represents the activities of the Attorney General Liaison Section Right of Way Bureau, Department of Public Works, for the Fiscal Year 1976.

The number of cases requested by the Department of the Attorney General totalled 82. The number of cases completed by the Department of the Attorney General and returned to the Department totalled 111. This section provided staff support and assistance in the preparation of each of these cases for trial or settlement by providing evidentiary materials, discussions concerning the takings and arranging for technical and expert witness to give testimony.

Additionally, this section provided legal advisory assistance to several Divisions and Sections of the Department by furnishing both written and oral opinions.

This Section also prepared 18 legislative bills which were introduced and heard by the 1975-1976 legislative session. There were approximately 36 written reports written on other legislative bills and appearance for oral testimony was provided on 24 legislative bills.

The staff of this section also has duties to appear before administrative hearings conducted by the Hearing Examiner, while the Supervisor of the Section serves as a Hearing Officer to hear relocation appeal claims. In this connection, the Hearing Officer heard and made written recommendations of findings on 8 hearings and participated as counsel to the Right of Way Bureau of a business expense claim hearing which lasted 5 days. Otherwise, served as counsel for the Right of Way Bureau for 10 business relocation claims.

The staff of this Section was also called upon to present a lecture for the Boston Bar Association seminar for the Committee on Eminent Domain.

The staff of this Section prepared 4 requests for opinions by the Attorney General and participated in processing 11 claims for special damages by residents of the City of Somerville.

OUTDOOR ADVERTISING SIGN CONTROL

The activities of this section are in compliance with the Federal Highway Beautification Act of 1965, and include the following responsibilities: Preparation of inventory of all signs located on Interstate and Federal Aid roads for determination of legal and illegal signs; preparing notices for all illegal signs; reviewing all applications to the Outdoor Advertising Board for permits to determine if they meet FHWA, criteria; and appearing at Public Hearings of the Outdoor Advertising Board regarding legality of sign locations.

As a result of this section, during Fiscal Year 1976, there were 4,410 signs removed throughout the state.

In addition to the removal of signs this section the additional responsibility to initiate a Junk Yard Screening Program throughout the state. Under this program two yards have been screened.

HIGHWAY CONSTRUCTION DIVISION

Contract Engineering

Final Review Section

HIGHWAY CONSTRUCTION SECTION

The Construction Section of the Department of Public Works supervised the inspection of approximately 80 miles of highway construction and related work awarded during the 1976 Fiscal year. This amounted in value to more than 99,250,000.

The Department continues its policy of strict adherence to State and Federal Environmental and Anti-pollution regulations.

The safety and convenience of the travelling public is given prime consideration and every effort is made to expedite the work and to safely continue the motorist on his way.

The Price Adjustment Clause for bituminous mixtures in current projects remains in effect, the asphalt adjustment authorized by St. 1974, c.554 for contracts awarded prior to 1974 continues to operate satisfactorily and implementation of St. 1974, c.857 for adjustment of other materials in contracts bid prior to 1974 has been authorized.

A summary of the various categories of projects follows:

	MILES	AMOUNT
INTERSTATE	52.2	55,633,263.68
PRIMARY SECONDARY AND URBAN	27.9	40,221,589.77
NON FEDERAL AID		3.402,980.95
	80.1	99,257,834.40

PROJECTS AWARDED DURING FISCAL 1976
INTERSTATE

	I-91	
Greenfield #18478	Fencing	267,410.00
Whately-Greenfield #18477	Fencing	293,823.50
Greenfield-Bernardston #18482	Fencing	249,265.00
		$810,498.50
	I-93	
Medford-Somerville Boston #18654	Roadside Development	384,496.50
Woburn to Andover #18674	Roadside Development	307,988.50
Boston #18810	Demolition of Clinton St. Ramp	318,476.30
		$1,010,961.30
	I-95	
Fall River-Dartmouth #18479	Fencing	205,510.00
Dartmouth-New Bedford #18497	Fencing	130,700.00
Mansfield-No. Attleboro-Foxboro #18517	Reconstruction 5.0 miles	3,888,357.75
Peabody #18531	Construction of Connector to Rte. 1	2,039,008.00
Attleborough-No. Attleboro #18499	Reconstruction 7.24 miles	6,928,512.00
Mansfield #18454	Information Center 12.24 Miles	306,000.00
		$13,498,087.75
	I-190	
Worcester-W. Boylston #18641	Reconstruction 1.1 miles	9,658,406.84
	I-195	
Seekonk-Rehoboth Swansea #18511	Safety Improvement 11 Miles	7,724,586.30
	I-495	
Haverhill-Merrimack-Amesbury #18470	Reconstruction 10.3 miles	4,932,229.00

I-495

Marlborough-Hudson Burlington #18412	Fencing	180,612.00
Littleton-Westford- Chelmsford #18471	Reconstruction 10.2 miles	7,571,450.49
Milford to Hopkinton #18594	Call Boxes	344,444.00
Chelmsford-Lowell- Tewksbury-Andover #18521	Reconstruction 7.4 miles	10,207,987.50
	27.9 Miles	23,236,722.99

PRIMARY ,SECONDARY & URBAN

	Route 1	
Revere #18560	Bridge Betterment	1,894,240.00
Walpole-Sharon-Norwood-Westwood #18783	Safety	343,655.00
Attleborough #18807	Safety	119,529.50
		2,357,424.50
	Route 1-A	
Norwood-Westwood #18562	Reconstruction 9.8 miles	2,297,571.00
	Route 3	
Pembroke-Marshfield-Norwell #18483	Fencing	83,375.00
	Route 3-A & 113	
Tyngsborough #18579	Sub-standard Bridge	679,010.00
	Route 6	
Dartmouth #18806	Safety	608,548.00
	Route 8-A	
North Adams #18782	Safety	286,593.75
	Route 18 & 28	
Weymouth-Randolph #18637	Safety	222,631.00
	Route 20	
Carlton-Auburn-Worcester #18771	Elimination of Roadside Obstacles	224,857.00
	Route 23	
Otis-Blandford-Russell #18459	Guard Rail	422,650.00
	Route 31	
Carlton #18452	Reconstruction 1.9 miles	692,399.22
	Route 32	
Chicopee-So. Hadley #18533	Reconstruction 4.1 miles	5,178,855.50

	Route 49	
Sturbridge-East Brookfield Spencer #18640	Roadside Development	155,155.00
	Route 60	
Malden #18561	Relocation 0.2 miles	392,365.75
	Route 63	
Northfield #18463	Reconstruction 0.3 miles	433,003.25
	Routes 106 &123	
Easton #18770	Safety	168,313.25
	Route 116	
Cheshire-Savoy #18653	Reconstruction 8.8 miles	1,498,327.00
	Route 125	
Haverhill #18620	Connector Ramp Construction	1,480,316.00
	Route 128	
Burlington-Woburn-Reading #18481	Roadside Development	68,465.00
	Route 202	
Granby #18766	Sub-standard Bridge	224,857.00
	8 Locations	
Auburn #18536	Traffic Signals	386,728.25
	Cleveland Circle & Beacon Street	
Boston-Brookline #18455	Safety	499,741.60
	15 Locations	
Boston #18496	Safety	1,124,326.84
	Old Colony Blvd.	
Boston #18493	Reconstruction .6 miles	918,515.70
	Summer Street	
Boston #18514	Bridge Improvement	626,310.40

	Dorchester Ave.	
Boston #18515	Bridge Reconstruction	359,780.00
	Atlantic Avenue	
Boston #18530	Relocation	602,002.25
	Rutherford Avenue	
Boston #18553	Pedestrian Overpass	433,574.00
	Dudley St. Terminal	
Boston #18563	Urban	2,121,853.00
	Gov't. Center Sts.	
Boston #18643	Reconstruction 1.2 miles	791,109.25
	Cresent, Summer, Grove & Lyman Streets	
Brockton #18460	Traffic Signal Installation	330,944.45
	Three Locations	
Chicopee #18596	Reconstruction & Traffic Controls	102,898.25
	Rte. I-391	
Chicopee #18681	Demolition	4,515.00
Chicopee #18687	Demolition	4,800.00
		9,315.00
Dedham #18763	Walnut Street Reconstruction-Urban	299,827.50
District #1 #18472	Safety Line Painting	59,060.00
District #2 #18488	Safety Line Painting	80,688.40
District #3 #18523	Thermo Plastic Pavement Markings	28,785.00
District #3 #18475	Pavement Markings	129,440.00
District #4-8 #18453	Impact Barriers	376,691.00
Districts #4-5-6 #18604	Removal of Roadside Obstacles	1,194,420.16
Districts #5 -8 #18492	Safety Line Painting	55,550.00

District #4 #18489	Safety Line Painting	65,180.31
District #6 #18491	Safety Line Painting	68,402.75
District #6 #18527	Thermo Plastic Pavement Markings	77,571.00
District #7 #18528	Safety Line Painting	99,833.08
District #7 #18490	Safety Line Painting	106,590.73
	Beach Road	
Edgartown to Oak Bluffs #18779	Resurfacing	213,395.00
	5 Locations	
Haverhill #18498	Safety	480,215.55
	Route 2	
Leominster #18606	Protective Screening Bridge	72,504.00
	Florence Street	
Malden #18487	Urban	1,280,007.00
	15 Locations	
Marlborough #18458	Safety Improvements	909,748.20
	Various Streets	
Melrose #18474	Traffic Control Signals	264,350.00
	Medford Street	
Medford #18573	Reconstruction	590,055.00
	Commonwealth Ave.	
Newton-Boston-Brookline #18570	Safety	3,656,322.58
	Various Streets	
Northampton #18672	Safety	37,010.40
	6 Locations	
Northampton #18522	Safety	160,588.00
	13 Locations	
New Bedford #18637	Traffic Signals	595,893.00

	Lowell Street	
Peabody #18468	Reconstruction 1.0 miles	867,352.65
	East Street	
Pittsfield #18469	Traffic Signals	337,763.00
	10 Locations	
Quincy #18557	Roadway Improvements	813,575.75
	Highland Ave. & Boston St.	
Salem #18524	Safety	391,869.00
	6 Locations	
Ware #18667	Safety	217,975.00
	Williams Riding Way	
Westfield #18644	Urban	23,577.25
	2 Locations	
Worcester #18686	Safety	57,990.00
	Rte. I-190	
Worcester #18677	Demolition	25,377.55
	14 Locations	
Woburn #18852	Safety	802,164.20

NON FEDERAL AID

	Route 25	
Middleborough #18457	Bridge Rail Replacement	49,863.00
	Route 3	
Bourne #18484	Traffic Signals	111,888.60
	Route 129	
Wilmington #18513	Demolition	1,148.00
	Route 85	
Hudson #18556	Demolition	949.00
	Route 20	
Brimfield #18572	Demolition	2,845.00
	Route 28	
Falmouth #18568	Safety	45,969.00
	Route 3A	
Braintree #18598	Bridge Deck Replacement	89,820.00
	Ball Square	
Somerville #18609	Broadway Bridge Protective Screening	14,000.00
	Route 2	
Acton #18631	Demolition	1,754.00
	Route 1	
Newburyport #18666	Reconstruction over Merrimac Street	1,076,185.00
	Sprague Street	
Boston #18673	Bridge Construction	173,915.00
	Southwest Corridor	
Boston #18706	Demolition	25,377.55

	West Street	
Williamstown #18715	Sub-standard Bridge	160,259.90
	Route 79	
Fall River #18742	Reconstruction 1.6 miles	559,547.00
	Holden Street	
North Adams #18773	Sub-standard Bridge	206,788.25
	Route 25	
Raynham-Middleborough #18778	Protective Screening 5 Bridges over Rte. 25	44,484.70
	Plum Island Turnpike	
Newbury #18777	Reconstruction	36,022.75
	14 Locations	
Woburn #18857	Safety	802,164.20

Contract Engineering

The Contract Engineer's Section processes the bids for Federal Aid Projects requiring F.H.W.A. concurrence, State Highway Construction Projects, Chapter 90 Projects, Maintenance Projects, Waterways Projects, Boring Projects, projects for the construction, reconstruction, alteration, remodeling, repair, or demolition of buildings under the provisions of General Laws, Chapter 149, and Right of Way Projects involving the sale of houses, and the leasing of State-owned property, from bid opening to award of contract and maintains all the necessary records thereof. The Prequalification and post-qualification of contractors is administered by this Section and the issuance of Proposal Forms and plans to prospective bidders requires the approval of this Section. Force account agreements with public utilities, cities and towns are reviewed for approval.

MAJOR ACTIVITIES

1. At bid openings all proposals are publicly opened and read subject to verification for arithmetical correctness, examination for informalities and compliance with applicable statutes.

2. After a bid opening all proposals are immediately checked for compliance with requirements. Proposals that are unacceptable due to incompleteness, irregularities, collusion, qualifying clauses, etc., are duly noted and if the deviation is a matter of substance that is prejudicial to the rights of other bidders a recommendation for rejection of such bid is made; on the other hand, a deviation may be merely a matter of form or some immaterial variation from the exact requirements that can be waived by the Commission under the right

MAJOR ACTIVITIES (CONT'D)

reserved. In the latter instance, if such bid is the lowest bid submitted, a recommendation will be made that the informality be waived and the project awarded to the low bidder as being in the best interest of the Department. After all bids have been checked and verified a "Summary of Bids" is prepared, printed and collated for distribution to interested Sections, Divisions, District of the Department, contractors who bid on the particular project, and local trade magazines and publications. Copies are retained for the Section's Records.

3. Letters recommending award or rejection are prepared and typed by this Section for the Chief Engineer's signature for presentation to the Board. Such letters are routed to our Fiscal Section for an assignment of funds. For work involving Federal funds, letters are also prepared and typed for the Chief Engineer's signature, requesting F.H.W.A. concurrence in the award or rejection of contracts as required by federal regulations.

4. Prequalification Statements submitted by contractors as required by General Laws, Chapter 29, Section 8B are analyzed, computed, and a rating determined for submission to our Prequalification Committee. Performance records of contractors who have previously performed work for this Department are maintained in this Section, and are designed to provide facts and documented data on every completed project and the contractor's performance. Such records provide a source of information for recommendations made by the Contract Engineer

MAJOR ACTIVITIES (CONT'D)

to the Prequalification Committee for the determination of Prequalification Ratings or limitations warranted by the facts.

5. For projects for which prequalification is not required, the low bidder and/or the lowest responsible bidder must submit a post-qualification statement, duly signed and sworn to, outlining his experience, equipment and financial resources on forms supplied by this Department. These post-qualifications statements are computed and analyzed exclusively by this Section and on the basis of the computation and analysis a recommendation for award or rejection is made to the Board.

6. Since the enactment of the Prequalification Statutes all requests for Proposals and Plans for bidding purposes have to be cleared and approved by this Section. This policy was adopted so as to prevent the issuance of Proposals and Plans to contractors who are ineligible to bid because of failure to meet the requirements of the Prequalification Statute and Regulations.

7. Records of all activities of this Section are maintained for purposes of documentation and source of information.

(a) A complete alphabetical file of all contractors who have performed work for this Department is kept current at all times. This file shows the location of each project which the contract has performed, the advertising date, bid opening date, bid amount, date of award, and starting and completion dates.

(b) A card index file for each project awarded, showing date of advertising, opening of bids, date of award, office

MAJOR ACTIVITIES (CONT'D)

estimate, bid price, contractor's name and address, contractor's qualification, start of construction, date of completion, extensions of time, if any, and contractor's performance record.

(c) A card file of projects awarded in each city or town, showing name of contractor, type of project, and the starting and completion date of all contracts performed within the city or town.

(d) Prequalified contractors, their prequalification rating and date of expiration.

(e) A list of "Active Bidding Contractors" who submit bids for any project for this Department each calendar year is prepared and maintained.

CONTRACT ENGINEER SECTION

PROJECTS AWARDED FOR FISCAL YEAR ENDING JUNE 30, 1976

NUMBER	CATEGORY	AMOUNT
77	FEDERAL AID	$ 96,668,432.21
20	STATE HIGHWAY CONSTRUCTION	2,938,829.61
25	CHAPTER 90 - STATE AID	6,817,089.45
186	MAINTENANCE	12,155,201.16
308	TOTAL	$ 118,579,552.43

DURING THE FISCAL YEAR JULY 1, 1975 TO JUNE 30, 1976 A TOTAL OF 401 CONTRACTORS WERE PREQUALIFIED.

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FINAL REVIEW SECTION

The Final Review Section assumes the responsibility of assuring the Bureau of Public Roads, the Department, Cities and Towns and the Contractors that quantities for payment are correct and equitable.

The processing of projects encompass the checking and reviewing of all field data recorded in survey books, pile driving book, manifold book and quantity control ledgers to ascertain that all calculations, engineering and accounting are proper and correct. The interpretation of the Special Provisions as a compliment to the Standard Special Provisions determines the limitations of payments for each and every project. The project checking includes the analysis of survey notes and plotting of the same in order to obtain quantities for every conceivable item of excavation as well as fill areas by mechanical means. Recently the computer has been utilized for these quantities when possible and has enabled this section to expedite projects with added accuracy. Projects that appear to lack the required data or may be inconsistent, necessitates a meeting with the Resident Engineer and/or his supervisor or assistants.

The initiation of pre-final teams which operate in the field at the time of construction of said project has been beneficial to the District, the Resident Engineer and this Section because of instant answers resulting in quicker solution of any discrepancies which may exist and also recommendations as to format, by representative of this Section may be offered prior to final entries.

The responsibility of the accuracy of an Extra Work Order or

Claim after the Vote of the Board of Commissioners for an estimated amount, particularly when the work is accomplished at a cost plus basis, results in many meetings and conferences with the Resident Engineer and/or his Supervisor or Assistants, Construction Engineer and the Hearing Examiner and/or his assistants.

This section is subject to audits by the Bureau of Public Roads and State Auditors and the utmost cooperation is rendered to achieve this goal.

The following is a breakdown of the values of various types of contracts processed by the Final Review Section during the period from July 1, 1975 to June 30, 1976.

FINAL REVIEW SECTION

BREAKDOWN VALUE OF CONTRACTS PROCESSED BY THE FINAL REVIEW SECTION

VALUE OF STATE HIGHWAY CONSTRUCTION CONTRACTS:	
HAVING FEDERAL AID PARTICIPATION	
State Highway Construction	$72,502,713.25
Maintenance	630,003.76
VALUE OF STATE HIGHWAY CONSTRUCTION CONTRACTS:	
NON-FEDERAL AID	$ 3,540,763.75
VALUE OF STATE AID (Chapter 90) CONTRACTS:	$ 7,356,931.18
VALUE OF MAINTENANCE CONTRACTS:	$14,563,514.82
VALUE OF MISCELLANEOUS CONTRACTS:	$ 56,211.60
(Includes Consultant Services, Boring Contracts, Boston (P.W.B. Contracts), Traffic, etc.)	
Total =	$98,650,138.36

NOTE:

Not included in the above totals are twenty-seven (27) Federal Estimates (Final Federal Aid Vouchers) which were submitted during the period of July 1975 through June 1976.

An important factor, pertinent to the Commonwealth (Department of Public Works) and specifically to this section, is that the grand total above includes the processing of a number of Extra Work Orders and/or Claims. These Extra Work Orders and Claims, proposed and approved by the Board of Commissioners, are subject to review and determination by this section, often resulting in a savings of hundreds of thousands of dollars.

In the future, for information and study, we are initiating a "comparison record" of the plus and minus monetary amounts in order to evaluate the approximate value in savings resulting from review of these Extra Work Orders and Claims.

HIGHWAY MAINTENANCE DIVISION

ANNUAL REPORT FOR 1976

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REGULATORY PERMITS

July 1, 1975 ---------- July 1,1976

During the year the following permits were issued by the Boston Office:

	No. of Permits
Heavy Equipment, House Trailers and Buildings	17,275
Utilities	218
Driveways	81
Total	17,574

During Fiscal Year 1976, 11,010 permits have been issued via transceiver.

PERSONNEL

In Fiscal 1976 the Personnel Unit of the Maintenance Office accomplished the following:

Processed six (6) Promotional Bulletins, twenty-six (26) Civil Service Certifications and four Vacancy Bulletins.

The Maintenance Organization Chart was revised.

Processing of Change in Status Forms for all Labor Service Personnel, for promotions, leave of absences, reinstatements, change in organization, classification, gang address etc., was continued. Post and kept an active-up-to-date record of personnel changes. Correspondence, internal and external pertaining to Labor Personnel.

Interviewing approximately 289 men, for positions in the Labor Service such as Traffic Electrician, Electrician, Highway Repair Foreman, Head Lock and Draw Operator, Lock and Draw Operator, Assistant Lock and Draw Operator, Bridge Repair Foreman, Bridge Maintenance Foreman and Communication Dispatcher.

* * * * * * * *

MAPS & STATISTICS UNIT

The Maps and Statistics Unit of the M.D.P.W. maintains and continually updates maps, charts and statistical records relating to the operation of the state highway system in Massachusetts.

These data include physical properties such as location, length, width, pavement thickness and type, and records of all work done on state highways as construction, reconstruction or resurfacing, projects.

From time to time this unit also prepares reports of maintenance expenditures and certain other fiscal activities of the Department, from records maintained by the data processing unit.

In addition to its regular activities the Maps & Statistics Unit participated in the preparation of several special projects including studies of environmental effects of the use of ice melting chemicals on water supplies and maple sugaring operations in the vicinity of State Highways.

Bridges acquired under Ch. 634 receive Cost Acct. # from this unit.

The following maps may be obtained from this unit:

1. Wide Snow Map, which is annually submitted to the Board Commissioners for official approval prior to release.

2. A Snow and Ice Control Map for each of the individual eight Districts.

3. Route Coding Map of the entire State on a scale of one inch equalling four miles.

4. Maps delineating each of the five Legislative Areas in the Commonwealth.

5. State Map of Cities and Towns delineating County Lines.

6. State Map of Cities and Towns delineating MDPW District Lines.

7. State Map of Cities and Towns delineating MDPW Highway Repair Section Foreman's Headquarters - each of the eight Districts.

8. State Map of Cities and Towns delineating MDPW Highway Repair Section within each of the eight Districts.

9. State Map of Cities and Towns delineating Federal Aid Primary and Federal Aid Secondary Highway Systems on a scale of one inch equalling four miles.

HIGHWAY MAINTENANCE

For the purpose of maintaining the surfaces of our State Highway System, including drainage facilities, shoulders and guardrails, each of the eight Districts of the State is divided, geographically, into working sections containing, as nearly as possible, ninety (90) lane miles of surface. Due consideration is given to other pertinent factors, such as isolated sections of State Highway, physical barriers etc., and necessary temporary adjustments made during the procedure of establishing the working sections.

Each maintenance section is staffed in accordance with a previously approved staffing formula within the limits of positions and personnel made available to the Department by others.

MAINTENANCE

Maintenance consists of routine physical maintenance work and betterment work. Physical maintenance consists of maintaining the highway and its existing facilities or restoring it to its originally constructed condition and includes surface treatments of thin bituminous concrete overlays of less than 3/4" in depth.

Betterments include improvements and additions to the originally constructed highway, such as drainage and guardrails, and includes overlays of 3/4" depth and over. Which represent capital outlays.

Physical maintenance and betterment projects are carried out both by using Department Forces and by contract. As our lane mileage increases each year, because of our lack of sufficient personnel and in the interest of economy and allowable time, most of the major items of maintenance, either physical or betterments, are being performed under advertised contracts.

The substance of this report will deal primarily with a summary of major items of physical maintenance carried out by contract, including resurfacing.

PHYSICAL MAINTENANCE

Routine maintenance operations were carried out by Department Maintenance Forces, and included such operations as minor shoulder repairs and certain shoulder or surface treatment with liquid bitumen and sand or stone cover. The regular program prepared to carry out surface treatment throughout the eight Districts of the State by the application of Class I Bituminous Concrete Type S.T., was not carried out this year due to lack of funds.

The Department has no maintenance depot or personnel located on the Island of Nantucket. Therefore, maintenance of the only State Highway (Siasconset Road) on this Island has been carried out by the Town of Nantucket under a contract with the Department. The sum of $10,000.00 was allotted for this work.

Twelve (12) Betterment Projects were carried out by contract during the year at a total cost of $310,000.00. Project work involved new drainage installations, slope and guard rail work, and chain link fencing. This amount was financed from the Accelerated Highway Program. In addition, one (1) Pavement Crack Sealing Contract was completed at a cost of approximately $15,000.00.

RESURFACING

No funds were appropriated for the regular resurfacing account for Fiscal Year 1976. However, $9,600,000.00 was made available from the Accelerated Highway Program.

Accordingly, a total of forty (40) contracts were awarded during the year for the resurfacing of approximately one hundred and thirteen (113) miles of highway with Class I Bituminous Concrete Type I-1, varying in widths from 24 feet to over 60 feet and varying in depth from 3/4" to 3".

Considering the fact that the two thousand eight hundred and fifty (2,850) miles of highway surface has an average life span of fourteen (14) years, it is evident that, even with the aid of Accelerated Highway Funds, additional monies must be devoted to resurfacing in order to maintain an adequate level of service.

MISCELLANEOUS

Preparation of the report on "Quotation Prices per Ton for Bituminous Concrete Patching Mix Furnished and Loaded at Plant" was expedited by the use of a Computer Program developed several years ago. The annual advertising date coinciding with the Fiscal Year has proven to be more effective.

In addition, three (3) contracts for the Discontinuance of State Highways were awarded for the upgrading of the facilities prior to the transfer of ownership to the municipality. The total cost was approximately $140,000.00.

As stated in the aforementioned paragraph, the Department's Annual Highway Program necessitates approximately 200 miles of highway resurfacing each year. During the five (5) year period 1972-1976 a total of 830± miles out of a theoretical 1,000 miles were resurfaced. Thus, the resurfacing program is operating with a 20% deficiency and should be significantly increased to prevent this constantly increasing gap.

Our Highway Design Standards now include many new safety features as specified by the AASHTO Traffic Safety Committee. These new Standards are usually not incorporated into an existing roadway until it is being reconstructed. In the meantime the majority of our highways continue to lack these betterment type features at the expense of the highway user.

The ever increasing traffic volumes, both rural and urban, plus the anti-skid type (studded) tires, tend to diminsh the effective life of a pavement, thereby increasing the frequency of the need for resurfacing.

Delay in obtaining adequate funds for surface treatments at the time they are initially proposed frequently results in deterioration of the surface where resurfacing becomes necessary at a much greater expense.

Our present Fiscal Year Calendar, although compatible with fiscal operations State-wide, is not in reality conducive to the most economical or efficient method of Highway Maintenance. Due to the seasonal limitation it would seem more beneficial to utilize the "construction season" for construction and the winter season for planning, instead of the present exactly opposite procedure.

Therefore, it is recommended that:

1. Appropriations for proper maintenance of our Highway System should be in balance with the normal requirements for same.

2. Such steps as necessary be taken from time to time to encourage the Legislature to make provisions for the preceding recommendation by making them constantly aware of the need.

EXPERIMENTAL WORK

The Federal Highway Administration has been promoting the use of an open-graded plant mix resurfacing coat for the past few years on pavements that have a history of skidding accidents or low skid test numbers.

Therefore, the Department last year designed and awarded six (6) resurfacing contracts, throughout the State, that included an open graded plant mix. These roadways are being observed and evaluated over the next several years, to ascertain the value of this new concept. At this time, the results we have experienced indicate that this type of mix may become a Department Standard.

Several resurfacing projects completed this year included the sawing and sealing of joints in concrete pavement overlays to control reflective cracking. Past use of this technique has exhibited promising results and we are continuing to use it.

One resurfacing project completed this year included the use of preformed Traffic Line Tape, a new concept in highway traffic striping.

ROADSIDE MAINTENANCE

Activities carried on under the Maintenance Section Roadside Development Unit during Fiscal 1976 consisted of the following work: Removal of Trees and Stumps - Mist Blower Spraying - Tree Trimming - Travel Trash Collection - Tree Planting for Erosion Control - Selective Clearing for Safety and Sight Distance - and Mowing of Grass. Normal Force Account Roadside Maintenance activities, such as Vista Clearing - Selective Clearing and Trimming - Brush Control for Safe Sight Distance - Emergency Tree Removal and Trimming along with Litter Pickup - Rest Area and Truck Turnout Improvement and Drainage Ditch Clearance and Spraying were carried on in all Districts.

The Cooperative Research Program sponsored jointly, by the Massachusetts Department of Public Works, Federal Highway Administration and the University of Massachusetts, Department of Plant and Soil Sciences of the College of Agriculture has produced and is continuing to produce demonstrative results. Slope plantings, in several Districts, of native seeds, root cuttings, evergreen seedlings, sweetfern, Crownvetch, Flat Pea and other container grown plants have been made as a direct result of the findings of the Program. All are showing remarkable improvement to stabilize slope erosion and to minimize the expensive mowing requirements. Woodchips were also found to be very satisfactory in the control of erosion on slopes.

To restore the forest floor in Rest Areas, we used aged bark mulch and wood chips. This was very successful. The Roadside Unit is constantly striving to keep informed of all the latest practical and cost saving methods in order to maintain the necessary maintenance of our Highways.

The Highway Landscape Supervisor, in the capacity of Technical Advisor to the Research Program is able to direct efforts in the field of combating erosion through planting material in the various environments and soil conditions of the State. He is also representative of the Commissioner, on the State Pesticide Board and in this position has access to first hand knowledge of desirable and undesirable chemicals used in destruction of harmful insects, weed control and soil sterilization along with instructions in their safe usage.

The Title X Application for Sight Distance Clearings for the Massachusetts Department of Public Works was approved by the Department of Commerce and $750,000.00 was allocated to the Department by the New England Regional Commission, the sponsor for the project. The grant was made available under the Title X of the Public Works and Economic Development Act of 1965, as amended, as part of the Emergency Jobs and Unemployment Act of 1974. The Project Coordinator and Construction Superintendent for the Grant were assigned from the Roadside Maintenance Unit.

ANNUAL REPORT -1976 - ROADSIDE MAINTENANCE(Con't)

REMOVAL OF TREES AND STUMPS

Dead, diseased and dangerous trees are removed in the interest of highway safety. This work was accomplised on a State-wide basis with 15 separate contracts for removal of 2,450 trees at a cost of $193,139.46: Removal of trees that are affected with Dutch Elm Disease is mandatory under the law. Trees that may present hazardous conditions should be removed to protect the public and avoid liability for the Department.

DISTRICT	NUMBER OF CONTRACTS	TREES REMOVED	COST
1	2	296	$30,740.00
2	2	389	44,815.00
3	3	544	24,124.00
4	3	456	28,090.00
5	2	274	27,885.00
6	1	218	12,331.46
7	2	272	23,895.00
	15	2,450	$193,139.46

MIST BLOWER SPRAY FOR SUPPRESSION OF DUTCH ELM DISEASE

This work was accomplished by contract in Districts 1 and 8, while Districts 2-7 undertook this work by Force Account. The cost of the two contracts totaled $9,304.75. Spraying all elm trees along our roadsides is necessary to protect them from the ravages of Dutch Elm Disease which is spread both by the Elm Bark Beetle and the Elm Leaf Bettle. Spraying for suppression of Dutch Elm Disease is a mandate of the Law.

POISON IVY SPRAYING

This work was accomplished on a State-wide basis under eight (8) separate contracts at a cost of $41,945.50. Spraying for the eradication of poison is maintenance work required by law.

CONTRACT EROSION CONTROL PLANTING

This work was accomplished under two erosion control contracts for furnishing and planting trees, shrubs, lining out stock, seedlings, and contailer grown plants along various State Highways under Two separate contracts in Two Districts - contracts totalling $70,534.50.

The trees, seedlings, lining out stock and container grown planting is part of our relentless struggle to control erosion.

DISTRICT	TREES	SHRUBS	SEEDLINGS AND LINERS	SWEETFERN	CONTAINER GROWN
2	108	537	300	550	3582
4	775		2000	800	5300

Dead, diseased and dangerous limbs are removed in the interest of safety to the traveling public and the health of the trees. This work was accomplished on a State-wide basis with nineteen (19) separate contracts at a cost of $202,348.00.

TRAVEL TRASH COLLECTION

Travel trash collection is done in the interest of public health and part of our program to keep 237 Roadside Rest Areas clean. Six contracts were awarded for the collection and disposal of travel trash through Contractor furnished containers using Packer Type Trucks. Nine contracts were awarded for the emptying of Department owned barrels. All contracts are for Fiscal Years 1976 and 1977. The total cost for all fifteen contracts for the 1976 Fiscal Year was $100,340.59.

MOWING OF GRASS ALONG STATE HIGHWAYS

The Mowing Program was severely cut back, in Fiscal Year 1976, to the point where it is now a substandard program. The number of cuttings on Limited Access Highways was reduced from four (4) to two (2), while the mowing of the secondary roads was eliminated. No Contract Mowing was done at all in Districts One and Two.

Thirteen (13) Contracts were the remaining half of the two (2) year contracts for Districts 3, 5 & 7 while the other thirteen (13) contracts were new contracts for Districts 4,6, & 8. The total cost for all twenty-six (26) contracts for Fiscal Year 1976 was $242,201.00.

WOOD CHIP UTILIZATION

Wood chips have been used effectively for the past several years for slope erosion. Because of a "no burning" law in Massachusetts, the Department of Public Works plans doing more of our State Highways with all the available wood chips that will be stock piled either in our pits or close to the job for use whenever possible. Over 500 miles of slopes and other areas have been successfully planted and mulched. This method of treating slopes has reduced mowing costs from 25-50% over areas that are all grass on roadsides and along slopes. Chips at a 3" depth in conjunction with the new environmental approach of covering slopes immediately under the prime contract is a natural and practical solution to our erosion problems. There are thousands of cubic yards of wood chips available from construction projects for Roadside Development resulting from trees removed by clearing and grubbing as well as selective clearing and thinning. There is a potential for large quantitites of wood chips from these sources.

CONTAINER GROWN PLANTS

This program was substantially reduced this year, due to budgetary restrictions. It is estimated that 40,000 container grown plants were planted, along the slopes of the State Highways, to control erosion. This practice has been proven to be quite successful and should be implemented at a much larger scale.

PREVENTIVE ROADSIDE MAINTENANCE

Developing preventive maintenance into over 60,000 acres of land that abuts the 2,800 miles of State Highway, which was originated several years ago, is still being pursued through wood chip mulching and planting of many areas, State-wide, with over 30 species of hardy seedlings, shrubs, ground cover, container grown plants, native seeds, natural growth sods and trees, contingent upon the availability of funds. When the ecology is right, natural growth is induced to fill in the planted area to present naturalistic roadsides.

SELECTIVE CLEARING FOR SAFETY AND SIGHT DISTANCE

Sufficient funds were available to award only one contract during Fiscal 1976 for this work. District Five, had the contract at a cost of $17,845.00.

This is for the improvement of the horizontal and vertical sight distance and recovery area adjacent to the travelled way. In addition removal tree material is reduced to wood chips for use in erosion control and planting by the Department.

In the interest of maintaining safe highways and increasing the aesthetic values, special attention was given to the following:

1. Exposing guard rail which may be screened by grass, brush or trees.
2. Reducing the number and extent of passing restrictions.
3. Widening the roadside area at natural turnouts and off-the-highway parking which are on the older State Highways.
4. Opening up scenic vistas.
5. Raising the branch level of trees to give 20 feet of height clearance.
6. Improving the visibility of all traffic signs, signals and lights.
7. Improving visibility in the vicinity of driveways and intersections.
8. Improving the general appearance of the roadside.

DITCH CLEARANCE

Obstructions to flow in drainage ditches contribute to soil erosion along our highways and inefficient flow of drainage system discharge. This year vegetation in existing ditches was sprayed by District Forces. Current obstructions in ditches should be cleared away under contract as our 1800 miles of ditches will be too much to ask our already under-manned personnel to attempt along with their other necessary duties.

CONSTRUCTION OF ROADSIDE REST AREAS

Modernization of existing rest areas and the critical need of construction of new facilities is considered essential in promotion of travel. Many of our existing rest areas are currently being used beyond a practical capacity.

Construction of Roadside Rest Areas (Con't)

Certain locations, State-wide, were selected for Roadside Rest Area Construction under the Administration of our past President Johnson's Beautification Program. It is apparent that no funds will be forthcoming under this program and other arangements must be made to provide these critically needed areas as soon as possible.

Recent field observations indicate that we do not have a sufficient number of Rest Areas on some routes. The existing facilities are being put to near capacity use by drivers of both passenger cars and trucks. Weekend observations noted double the usage and a definite lack of sufficient facilities.

Land values are rising rapidly particularly near new expressways. Further delay in obtaining land and designing areas will make for high cost in future construction. Action should be taken now.

REST AREAS (MAINTENANCE AND IMPROVEMENT)

The Roadside Maintenance Sections in Boston and in all Districts are constantly working to improve the aesthetics, facilities, service and environs of the Rest Areas on State Highways.

Tourism is a major industry in the Commonwealth, and the "REST AREA" is the most functional selling point to the motoring public when its services are needed.

In an attempt to reduce maintenance cost, various Districts have undertaken Programs on an experimental basis. Among the programs underway is a method of permanently positioning picnic tables by using steel beam guard rail posts as anchors; selective clearing and thining of rest area and immediate application by machine of wood chips to the entire area to reduce mowing and brush control and other programs.

Annual maintenance consists mainly of repainting trash barrels and refurbishing picnic tables. Materials are purchased annually for this work. Replacement of missing or damaged barrels and tables is made as funding permits. This year seven hundred (700) tables were purchased for use in the 237 Rest Areas throughout the State.

In an effort to maintain a clean and healthy Rest Area, Travel Trash Contracts for the removal of accumulated rubbish from the barrels and contractor-owned containers are awarded annually under the Maintenance Program. Inspection of the contents of the filled barrels and containers sometimes makes one suspect if the rubbish is associated with "travel" or "household".

A properly maintained rest area is an integral part to a complete Massachusetts Highway System and the enjoyment of the scenic eviron of the State.

TITLE X - SIGHT DISTANCE CLEARING

The purpose of Title X is to provide emergency financial assistance to stimulate, maintain, or expand job creating activities in areas, both urban and rural, which are suffering from unusually high levels of unemployment. The projects are "Labor Intensified" and are concerned mainly with Roadside Safety for the motoring and pedestrian traffic.

The 147 new employees have been recruited from areas where elegible projects are located with preferred consideration given to unemployed persons without unemployment benefits who reside in the area. The Department of Public Works instituted a vigorous Statewide recruitment campaign to employ minorities who qualified under the above categories and have been very successful with minority recruitment reaching close to 50% for the Boston area.

The work is scheduled to be done throughout the Commonwealth, from the Mohawk Trail to Cape Cod. The projects will provide proper horizontal and vertical sight distance presently hindered by roadside growth. The projects will also enhance the aesthetic and functional value of the State Highway System.

When the program is completed, motoring tourists to the State during our Bicentennial Year will be afforded the opportunity to better enjoy the scenic beauty of the Commonwealth along safer highways.

STRUCTURES MAINTENANCE

BRIDGES

As of July 1, 1976, the Department had maintenance responsibility for a total of 2,548 bridges, having a total workload area of approximately 2,700,000 square yards.

All Bridges for which the Department has responsibility have been inspected at least every two years since the inception of the program. Underwater inspections have been made on a "requested" basis, a program is now being implemented to insure regular underwater inspection in conjunction with above water inspection. Salt corrosion and "Half Cell" deck tests are now programmed on a regular basis.

Recently acquired Railroad Bridges have been inspected and programmed for repair, demolition, or replacement.

Computer programs have been made available to District Structures Maintenance Personnel through the District Computer Terminals to enable faster response to questions concerning various Bridges.

Communications Towers have been inspected and programmed for repair and regular maintenance.

The following sections although not "all inclusive" will give some indication of the magnitude of typical operations.

DRAWBRIDGES

The Department had operations and maintenance responsibility for seventeen (17) Drawbridges located over navigable waters.

LOCATION OF DRAWBRIDGES	OPENINGS DURING FISCAL 1976
Amesbury - Deer Island Bridge over Merrimack River	81
Beverly - Salem, Route 1A over Danvers River	1,509
Beverly - Salem, Kernwood Avenue over Danvers River	1,744
Beverly-Hall Whitaker Bridge over Bass River	24
Gloucester, at Blynman Canal Route 127 over Annisquam River	9,486
Haverhill - Groveland, Route 97 over Merrimack River	13

LOCATION OF DRAWBRIDGES	OPENINGS DURING FISCAL 1976
Haverhill - West Newbury, Rocks Bridge over Merrimack River	27
Newbury - Plum Island Turnpike over Plum Island River	93
Salisbury - Newburyport, Route 1 over Merrimack River	1,289
Fall River - Somerset Brightman Street over Taunton River	983
New Bedford - Fairhaven, Route 6 over Acushnet River	548
Quincy - Weymouth, Route 3A over Weymouth Fore River	620
Westport Point - Route 88 over Westport River	127
Scituate - Marshfield, Route 3A over North River	8
Tisbury - Oak Bluffs, Beach Road over Lagoon Pond on Marth's Vineyard Island	360
Boston - Milton, Granite Avenue - Route 3 over Neponset River	884
Lynn - Saugus, Western Avenue over Saugus River	3,177
TOTAL OPENINGS	20,973

CLEANING AND PAINTING OF BRIDGES

The cleaning and painting of bridges is one of the most important operations in the Structures Maintenance Unit. It is preventive Maintenance in that it preserves and protects the initial investment.

During Fiscal 1976, six (6) contracts were awarded for the Cleaning and Painting of twenty (20) bridges - a total cost of $415,020.00.

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CONTRACT PROJECTS ON CHAPTER 634 ACTS OF 1971 RAILROAD BRIDGES

The following advertised contracts were funded from the current allotment.

City or Town	Location	Type of Work	Cost
Pittsfield	Rte. 20/Penn Central R.R.	Bridge Reconstruction	$129,570.00
Springfield	St. James Ave./ Penn Central R.R.	Bridge Reconstruction	86,440.00
Boston	Maverick St./ Penn Central R.R.	Bridge Reconstruction	112,510.00
Natick	Washington Ave./ Penn Central R.R.	Demolition of Bridge & Replacement with Acrow Panel Bridge.	43,340.00
Springfield	Armory St./ Penn Central R.R.	Bridge Reconstruction	203,090.00
Hinsdale	Rte. 8/Penn Central R.R.	Bridge Reconstruction	47,250.00
Hopkinton-Westboro	Fruit St./P.C.R.R. and Sudbury River	Bridge Reconstruction	163,360.00
East Boston	Curtis Road/ Penn Central R.R.	Bridge Reconstruction	127,000.00
Richmond	Rte. 41/West Stockbridge Rd./ P.C.R.R.	Bridge Reconstruction	57,510.00
		Total	$970,070.00

CONTRACT MAINTENANCE PROJECTS

City or Town	Location	Type of Work	Cost
Oak Bluffs – Tisbury	Beach Road/ Lagoon Pond	Drawbridge Operation and Maintenance	$4,110.00
Norwell – Pembroke	Rte.3/North River	Bridge Deck Repairs	74,990.00
Townsend	Rte. 119/ Willard Brook	Bridge Repairs	41,800.00
Boston – Cambridge	Rte. I-93	Furnish and Install Dry Hydrant Fittings	13,430.00
		Total	$134,330.00

CONTRACT BETTERMENT PROJECTS

City or Town	Location	Type of Work	Cost
Boston	South East Expressway at Neponset Circle	Bridge Deck Betterment	$233,570.00
		Total	$233,570.00

STRUCTURES INVENTORY AND APPRAISAL PROGRAM

This unit continues to process and update all data as it is received from the various districts; The Metropolitan District Commission, The Mass. Turnpike Authority, The Mass. Port Authority and the U. S. Army Corps of Engineers for those bridges on the Federal Aid Highway System, as required under the 1970 Federal Aid Highway Act.

Priority Lists have been prepared and distributed and are significantly advanced over earlier attemps.

The various Districts have been given access to the computer file through the District computer terminals. This program will be expanded as the District personnel become more adept and aware of the potential savings in time and effort.

UNDERWATER BRIDGE INSPECTION TEAM

This unit continues to perform on a regular basis underwater inspections of bridges, pilings, fender systems, footings,piers and related items. This work is invaluable in discovering defects that although hidden from view could have far reaching effects.

A Qualifying training session was held during the spring of 1976 with 16 divers completing the course.

Presently the teams are inspecting approximately 100 bridges during the course of the year. We must double our capacity in the near future. Toward this end, requisitions have been processed and forwarded to the Governor's Highway Safety Bureau for additional equipment. Planning is now underway for a full scale training program to recruit and train additional divers.

INSPECTION EQUIPMENT AND DEVICES

The second "Inspector 50" has arrived and is operational. This doubles our capacity for inspections of normally difficult locations. Deployment of the two machines will enable simultaneous operations in both eastern and western parts of the state.

"Pachometers" and Rotary Drill/Hammers have been obtained to enable each District to have it's own set of testing equipment. This facilitates inspections previously delayed due to equipment scheduling. Profiles of "Salt Penetration Readings" and "Half-Cell Readings" for critical bridge decks are being intitated for anslysis and corelation.

TRAFFIC MAINTENANCE

GENERAL

As predicted in the fiscal 1975 annual report the current personnel and fiscal problems associated with maintenance have caused the Traffic Maintenance Section to adjust programs and operating procedures throughout the year.

While a certain amount of adjustment is expected during "normal" times, extensive variation in programs introduces a loss of control on field requirements.

At the annual Traffic Maintenance meeting field personnel underscored the dire circumstances that maintenance crews find themselves in due to lack of personnel, Of particular concern is the failure of the Department to entice the young capable people into the work force.

Not only are there too few personnel to provide adequate traffic maintenance but it becomes impossible at times to perform efficiently due to lack of equipment or equipment breakdown.

It is paradoxical that as the traveling public becomes more prone to sue governmental agencies and personnel for negligence the maintenance organization becomes less capable to provide corrective action.

It is hoped that the proposed Maintenance Management studies will help to delineate the critical areas of need in Traffic Maintenance, particularly in regards to field personnel.

TRAFFIC SIGN MAINTENANCE

A. Breakaway Sign Supports

The program to replace fixed sign supports with supports that yield on impact (breakaway) continued this year on a statewide basis.

The major portion of the work is being done under 3 federally aided contracts at a total estimated cost of $2,283,000.00. This work is funded 90% by the federal government.

State forces still have not become proficient at installing the larger breakaway posts which require a concrete foundation. The reason for this could be that this activity usually requires an earth anger to excavate the foundation hole and the Department does not own such equipment.

It will be necessary to either buy or rent angering equipment or continue to have a contractor do the installation if breakaway posts are installed on a continuing basis.

B. Sign Washing

Sign washing continues to be an activity that lends itself to contract work. The field forces find it very difficult to make this operation a part of their normal work routine.

The equipment being used by the contractors to do the sign washing is becoming quite specialized.

The increased efficiency by the contractors resulted in a 31% reduction in bid prices over 1975.

Four contracts for sign washing were awarded this year, totaling $7,700.00.

C. Mile Markers, Tenth of Mile Markers and Delineators

One contract, covering the eight districts, was awarded for replacing and updating tenth of mile markers, mile markers and delineators.

This is yet another area that it has become necessary to augment the force account work with contract work. There just are not enough workers or materials to keep up with the knockdown of these units.

The installations this year will be using larger mile markers in keeping with federal highway standards.

D. Sign Orders

This year saw a continuation of the increased activity in sign ordering. There were 1065 sign orders processed. The District totals were as follows:

District	Number of Sign Orders
1	117
2	170
3	89
4	150
5	77
6	123
7	250
8	89

PAVEMENT MARKING MAINTENANCE

A. General

Contract striping, except for federally funded projects, was non existant this year because of a decrease in the budget from $1,135,000.00--(fiscal 1975) to $736,000.00--(fiscal 1976).

The following adjustments in the pavement marking maintenance program were necessary:

a. All state highways requiring painting would have to be done with state personnel.

b. No painting will be done on non-state highway numbered routes by state personnel unless the municipality supplies the material. This work could only be done after state highway work was completed.

It is emphasized that the Department's policy to apply thermoplastic markings to new surfaces where the ADT is 15,000 and over has saved the situation in this year of severe budget reduction. Although costly, the thermoplastic marking is more durable than the painted marking and will last for a few years depending on the roadway alinement and traffic volume.

PAVEMENT MARKING MAINTENANCE

B. Federal Funding

Fiscal 1976 saw a continuation of federal participation in two areas of pavement markings. These were painted markings under Section 205 of the 1973 Federal Highway Act, and thermoplastic markings on certain State highways that now have painted markings.

• The Federal Funded Pavement Marking Demonstration Program (Section 205) had an original appropriation of $995,000.00 to be expended over a three year period. This work will be completed during the summer of 1976.

The first two years work has been completed at a cost of $746,645.00 leaving $248,355.00 to complete the program. This program provides for the striping of roads both on and off the Federal System with the emphasis on two lane rural roads.

The program to replace painted markings with thermoplastic markings provides a longer wearing line in areas where repeated painting would be necessary. This activity reduces material usage but more important it reduces the number of times a work crew has to occupy the roadway.

Thermoplastic lines replaced painted lines in Districts 3,6, and 7. The work amounted to $226,807.00 of which $176,645.00 was provided by the FHWA.

C. Paint Conservation

Over the past couple of years an effort has been made to conserve pavement marking material (paint and beads) by varying the line length and the application pattern.

After field observations, permission was requested, and received, to use a 10' long paint stripe rather than a standard 15' stripe. While this striping pattern will save some paint and beads during this striping season a more substantial savings should be realized when it is possible to reduce the length of the thermoplastic stripes to 10'. If the shorter line works out this striping season it is planned to request that the shorter line become the Department standard This would be a 10 foot stripe and a 30' space between stripes.

D. Force Account Striping

Other than the pavement markings applied with federal assistance all pavement markings on state highways were applied with state forces.

The following is a list of the major materials purchased to carry out this activity.

a.	White fast dry paint (chlorinated rubber)	47,520 gal.
b.	Yellow fast dry paint (chlorinated rubber)	37,870 gal.
c.	White high heat paint (20 sec. dry)	42,600 gal.
d.	Yellow high heat paint (20 sec. dry)	39,158 gal.
e.	Black paint	1,200 gal.
f.	Glass beads	892,200 lbs.
g.	Thermo powder for crosswalks	29,000 lbs.
h.	Thermoplastic	30,000 lbs.
i.	Toluene	27,300 gal.

Due to favorable bids received on pavement marking materials and the elimination of contract painting it was possible to purchase more materials than normal for force account work.

Another factor that has helped to assure an adequate supply of pavement marking materials for striping state highways was the decision to not paint the non state highway numbered routes. This has been done in the past for the Cities and Towns when resources were available.

E. Contract Striping

There was no contract maintenance pavement marking application during fiscal 1976.

All contract work performed in both the paint and thermoplastic area was Federally Funded.

F. Experimental Work

1. Thermoplastic

The second year of a federally funded experiment in which thermoplastic is applied to every third bar annually for three successive years was completed.

Field inspection has shown that by the application of one new line in three it is possible to always keep a serviceable lane line on the highway in some areas.

The success of this work would seem to be in the volume of traffic and the alinement of the roadway. For instance on I-290 in Worcester it was not possible to keep a line in place since the thermoplastic would wear out in less than a year (ADT= 60,000). However on I-495 and I-295 the "every third bar" application worked very well (I-495 ADT=17,000, I-295 ADT=10,000).

While experimenting with painted line spacing this year it was found that adequate delineation could be provided by painting every other stripe on divided highways.

Combining this data with the data collected on the "every third bar" thermoplastic experiment it is determined that some efficiency could be realized with striping every other bar using thermoplastic. This will be tried on future experimental work.

Due to some failures which have been reported with thermoplastic lately, the research and materials section has been investigating the specification for this material.

2. Paint

During the past few years the Department has used a so called "chlorinated rubber" traffic paint and a 20 second dry paint. Each has its specific use but there has been quite a difference in price between the two. The cholrinated rubber paint averages about $3.47/gallon while the 20 second dry paint averages about $2.55/gallon.

It is alleged that the chlorinated rubber paint is more durable than the 20 second dry paint and field observation would tend to prove this out. There is a federally sponsored project being conducted at the present time which will hopefully come to some conclusions in this area.

The chlorinated rubber paint although thought to be more durable has taken quite long to dry in the past. Research and Materials has worked during the past winter to improve the dry time and it is felt that this season's paint will bear this out.

ELECTRICAL MAINTENANCE

A. Traffic Signals

The processing of Traffic Signal Contract Work was slowed over previous years due to the scarcity of funds in the signal accounts. Alternate accounts had to be utilized to pay for some of the 18 reconstruction and the 5 construction proposals processed by this unit.

Consultants are now being used by the Department to design some signals on State Highways. The plans for the projects are being submitted to this unit for comments. When the comments are of a most serious nature, a meeting with the consultant is called by Traffic Engineering and Maintenance is invited to attend. This system allows the maintenance staff to provide input for new and reconstructed signal projects in order to reduce future maintenance problems.

During the past fiscal year the maintenance section has stipulated that each contractor working on an "Electrical" project, as stipulated in the Special Provisions, have a master electrician's license assigned to the company. Some firms complained rather bitterly about this requirement initially but now the signal contractors file a complaint if the low bidder is a non-conforming company. What originally most signal contractors did not want is now heartly endorsed by them.

Again this year we have experienced shortages of critical traffic signal equipment. Signal Housing, Signal Post Bases and Load Relays were in particular short supply. The Traffic Unit instituted a monthly report from each District with a copy to the Superintendent of Shop and Equipment setting forth the material shortages experienced by each. In spite of the information flow to the Wellesley Shop, shortages still occur. The Administration effort to reduce an already inadaquate budget is the reason for current material problems.

The Federal Government has stated that all State Highways shall conform to the Manual for Uniform Traffic Control Devices by December 31, 1976. Massachusetts will not be 75 percent done by this date and as long as there are insufficient funds, it will take several more years to approach the standards.

An ongoing evaluation of a Traffic Signal Energy Saving Device indicates an overall power savings of around 15 percent. These devices attach to the top of the Signal Housings and determine the level of illumination. When nightfall comes, the dimmer reduces the lampfilament voltage to a level where it is still bright enough to control traffic properly. The reduced voltage saves energy.

B. Highway Lighting

In another effort to conserve energy the state owned or leased streetlights were extinguished for one night and such a clammer arose, that they were returned to normal operation the next night. There is apparently strong negative feelings toward saving energy thru turning off highway lighting. The federal government also took a dim view of the black-out. In view of the fact that 90 percent federal funds were used to construct or reconstruct the lighting facilities, their stand seems justified.

There has been nothing new in purchasing of equipment that will lift our service personnel 50 or more feet into the air to service the new street light luminaires. This issue will have to be faced as malfunctions occur. Perhaps initial repairs should use rental equipment.

The inspection of new lighting installations is far from adequate. There is evidence that there is a definite lack of expertise in the Department for the inspection of electrical installations. The electrical installations are becoming more common and more sophisticated with time. If the department is to protect these costly investments it should make the companion investment in qualified personnel. It would seem that the best method would be to train existing personnel in the specialized area and then hire "all purpose" personnel rather than hire specialists and train them to be "all purpose".

A program is now underway to install "Breakaway" bases on existing street lighting that does not now have this feature. If the light support is behind guard rail or protected by a vertical curb of at least 7 inches in height; it does not qualify for the safety feature.

In the previous year we were able to have electrical contracts in two districts to rectify faulty wiring as installed by the original street light installation contractor. This year the two districts were fortunate to hold the line on street light maintenance. Plans were to expand this type of renovation contract as it proved so sucessful but once again there were no funds for it.

C. Closed Circut Television

This year District 8 did not wish to advertise for a television repair contract for the Dewey Square Tunnel as experience has shown that it is just about impossible to maintain the present "New" installation. A member of the District 8 Maintenance Personell who has graduated from a commercial technical school is attempting to restore some order to the present system. This installation is a classic example of the type of electronic nightmare that maintenance forces cannot keep up with. In this case even a qualified maintenance contractor has been reluctant to provide service.

The Department has had installed a closed circut T.V. system that extends from the Dewey Square Portal North along I-93 to Somerville. If this system is to be maintained at all it will have to be by a specialist under contract. Under present staffing the Maintenance Section will find it impossible to maintain this costly sophisticated system.

D. Radio Call Boxes

When the 800 or more Motorist Aid Call Boxes were installed, plans called for the Department to have the option to renew the maintenance portion of the original contract for 4 years. The only thing wrong with this concept was that there was no money encumbered for this maintenance work. Also, whenever a box was knocked down or otherwise put out of commission, the contractor was to be paid with an extra work order to restore it to operation. This practise was also terminated; no money. For a number of months, several hundred call boxes received no maintenance. Finally the Maintenance Office received $15,000.00 to care for the I-495 Hopkinton-Salisbury system for the last 2 months of this fiscal year. Next year a second section (I-195 Seekonk to New Bedford) will be under a maintenance contract along with the aforementioned Hopkinton-Salisbury section. $50,000.00 has been included in the 1977 budget to fund this work. There is no way of knowing at the present time if this amount of money will be sufficient to perform a year of maintenance on the system. It could be more or it could be less depending on the number of knockdowns.

At present the Traffic Maintenance Unit is investigating the possibility of having the department send one of the radio mechanics to school to service the call boxes. If the man does go to school and services the call box system, the radio shop should have another licensed technician to take his place. It is not possible to simply add to existing work loads and expect continued efficiency in all areas.

The "Maintenance Free" call box system has proved to be anything but maintenance free. In a six month period on one system alone there were 14 service calls for servicing the boxes not counting service to the relay system which is a seperate maintenance system from the call box unit repairs.

IMPACT ATTENUATORS

The installation of crash attenuators by the department slowed a bit and from a maintenance point of view this is good. It seems that particularly in the high volume traffic areas due to the scarcity of men, material and equipment some of the attenuators remain inoperative for a long period after impact.

Vandalism is taking it's toll on the impact units. In the case of the sand barrels it is common to find the outer shell worked up to spill out the sand. A case was reported where the lead barrels had large stones placed inside. Vandals have also punctured the outside cells of the Hydrocell units, thus rendering the unit useless.

There is no question but Impact Attenuators have proven very effective in protecting vehicle occupants from death and serious injury. The major problem is not effectiveness of the concept, but the availability of repair parts.

It has been determined that an Impact Attenuator is a unique device, since it is effective only when it is being destroyed, and that it's replacement does not fall into the category of maintenance.

The FHWA has announced that replacement parts are now eligible for funding. This enables State and Local Jurisdictions to purchase replacement parts when requests are submitted as part of the annual work program. However, it will take some time before this finding and follow through is operating effectively.

SUMMARY

Interwoven in this report is the appeal for a more positive move by the Administration for responsible funding.

With each increase in the physical plant there must be a companion increase in the maintenance capabilities. As sophistication in facilities is increased more technically qualified personnel should be provided.

At the time of each new project conception there should be some type of maintenance capability report filed showing how the proposed project will effect maintenance.

Until this is done there will be continued wasting of the taxpayers money thru installing facilities that the maintenance section cannot keep up with.

Without responsible funding preventive maintenance routines soon become crisis maintenance. That time is here.

HIGHWAY EQUIPMENT

(NEW)

No.	Description	Req. #	Cost
1	Thermoplastic Applicator	070-0629	$2,000.00
1	Thermoplastic Melter	070-0629	$5,000.00
3	Vibrating Roller	070-0631	$6,000.00
2	Infra Red Heater	070-0630	$10,000.00
1	Paver	070-0632	$8,000.00
1	Asphalt Storage Unit	070-0634	$8,000.00
3	Tractor Mower	070-0628	$24,000.00
		SUB*TOTAL	$63,000.00

(REPLACEMENT)

No.	Description	Req. #	Cost
16	Dump Trucks	070-0627	$320,000.00
4	Utility Trucks (w/radios)	070-0626	$28,000.00
7	Pickup Trucks (w/dump bodies)	070-0625	$49,000.00
5	Tractor Mowers	070-0628	$40,000.00
		SUB*TOTAL	$437,000.00
		GRAND*TOTAL	$500,000.00

TWO-WAY RADIO COMMUNICATIONS

The Department's Two-Way Radio Communication Network licensed by the Federal Communications Commission and operated and maintained by Maintenance Personnel in accordance with the provisions of Part 89 of the Commission's Rules, regulating conduct of the Highway Maintenance Radio Service, continued to provide an efficient means of communications during the routine and emergency activities of the Department during the year.

At the present time the network consists of the following units:

MAINTENANCE SECTION

A.	1	Monitor Control Station
B.	10	District Base Stations
C.	6	Microwave Links with Related Terminals
D.	10	Auxiliary Base Stations
E.	6	Auxiliary Civil Defense Stations
F.	2	Emergency Portable Stations
G.	488	Mobile Stations in Cars and Trucks
H.	32	Citizen's Band Portables and Related "Walkie Talkies"
I.	12	Monitor Receivers for Storm Emergency Message Reception.

Continuing Department Policy to "upgrade" the entire communications picture installation was completed in District Two of the new microwave link between Mount Pelham and the District Office. This assures total District Two coverage. Retention of the original base Station (KCB 552) on Mount Shelburne provides the District with a reliable standby for use in emergencies.

A study was also implemented to improve communications for the hilly southeastern Massachusetts area with a view to bettering facilities and coverage for both Districts Six and Seven.

Specifications were also drawn by the Communication's Unit, bids solicited and opened and four mobile units having four channel capability were received into stock providing a small but adequate replacement reserve for immediate emergency use.

Implementation of the 4 channel use plan previously approved by AASHTO Radio Frequency Committee and F.C.C., after detailed and arduous testing and coordination by the Communications Unit is expected to begin by modification and adaptation of equipment in District Five during this fiscal year thus reducing "self jamming" of the system in storms and other emergencies.

With characteristic foresight, in Fiscal 1976, plans were made by the Maintenance Engineer and a training program implemented by the Equipment and Communications Engineer to provide support for licensed Contract and Department technical personnel in each District in the removal and partial installation of mobile radio units.

Substantial savings in time and contract funds with a concurrent decrease in "off the air" time are being accomplished by this program.

At the annual District Maintenance Engineer's Meeting on Communications visual aids were monitored and technical manuals reviewed with a view to coordinating these items into the Training Engineer's programs and thereby to improve base and mobile operative performance.

The matter of an auxiliary generator to power radio equipment and lights at Department Headquarters at 100 Nashua Street has been partially resolved by acquisition of a Federal Surplus Generator presently in storage at Wellesley pending final arrangements for installation at Nashua Street.

The fog alerting procedure initiated by the Maintenance Engineer and developed by the Snow and Ice Control Staff continued to operate during Fiscal 1976. This procedure requires members of the Communications Unit to contact the State Police by an all Points Teletype bulletin when a forecast is received predicting foggy conditions. Upon receipt of confirmation from the State Police of the development of fog to a hazardous driving condition, the Maintenance Engineer or his designees alerts State Forces via the Communications Unit to take appropriate warning action in the foggy areas, thereby safeguarding the traveling public; and the Department against liability in these matters.

Forethought in the procurement of Gersch and Cushman Frequency Meters began to repay the Department's investment by producing certifiable primary frequency measurements acceptabel to the F.C.C. and provided positive assurance against "drifts" into other assigned areas of operation. Use of the equipment eliminated reliance on a contract service with consequent savings and increased efficiency in operations.

The aforesaid radio maintenance personnel continued to perform preventive maintenance and emergency repairs on Department radio equipment with priority being given to base station operations. "Outs" and operating costs were kept at a reasonable minimum.

In accordance with Legislative Mandate and Department Policy, the two way radio network of this Department was coordinated with the Stae and Federal Civil Defense Agencies. Consultation was also held with the Department's Liaison Engineer at M.C.D.A. and Communication Dispatchers instructed in reception of information from severe storm spotters whose field observations are transmitted via the Nashua Street Radio Room to M.C.D.A. for further transmission to Logan Airport via "NAWAS".

The Department's Auxiliary Civil Defense Network consists of Base Stations licensed to operate on Department Frequencies and located as follows:

1. State Control	Framingham
2. Area	1- Tewksbury
3. Area	2- Bridgewater
4. Area	2- Sector (2C) - West Dennis
5. Area	3- Westborough
6. Area	4- Belchertown

Assistance was provided by the Maintenance Communications Unit in the preparation of radio maintenance and repair contracts in order to insure uninterrupted communications to the Districts by assuring the services of a reputable contractor in each District.

In accordance with a request from the American Association of State Highway Officials, the Deputy Chief Engineer for Highway Maintenance agreed to serve as Member for Massachusetts on the AASHTO Subcommittee on Communications, whose function is to coordinate applications for frequency allocations in the Highway Maintenance Radio Service and local Government Radio Service with the Federal Communications Commission and other Public Safety Radio Service Committees and users.

While the function of the indicated Subcommittee is advisory and does not bind the Commission or the applicant, the Commission states in its Rules and Regulations that, in its absence, proof of notification and concurrence to all co-channel and adjacent frequency users within a radius of 75 miles or a costly engineering survey must be provided with the applications. In the course of the Fiscal Year 129 applicants availed themselves of this Public Service, either on their own behalf or through an authorized coordinator in the Public Safety Radio Service.

Mobile operations are conducted by the use of the State - Wide Network authorized in the Department's license for the Call Sign KA - 8171 and there is a mobile station for this Department in the Civil Defense Mobile Station van. As previously indicated, two additional frequencies have been authorized for mobile use.

The emergency communications net, which was established to provide a liaison apparatus with the United States Bureau of Public Roads, the Emergency Broadcast System, and related Federal Agencies in the Boston area for the relay of Federal Defense Conditions messages continued to be maintained on a standby basis.

CIVIL DEFENSE

During the 1976 fiscal period the following progress was made:

1.- Revised and updated the (EHTR) Emergency Highway Traffic Regulation Plan.

2.- Revised and separated the Construction and Housing Sections of the Emergency Resources Management Plan -- The Department under the new revision will only be involved in the construction phase of this plan.

3.- Presently involved in planning a Department Disaster Plan in conjunction with a task force assigned to the Civil Defense Agency to develop a Massachusetts Disaster Preparedness Plan.

4.- Held a meeting of District C D Area Engineers to inform them of the latest developments with regard to C D activities as they effect the Department and their C D responsibilities during times of emergencies.

5.- Particpated in developing an evacuation plan for the nuclear plant in the town Rowe and surrounding communities.

MAINTENANCE TRAINING

As part of a comprehensive training program for Maintenance personnel a Heavy Motor Equipment Course was developed and coordinated for fourty-eight (48) employees of the Labor Service. Conducted at the Lexington Maintenance, the class commenced on April 13, 1976 and ran for a period of 9 weeks or 81 hours to completion.

The objective of the program is to train and fully qualify Maintenance personnel in the operation and maintenance of heavy hydraulic and cable motor equipment, gain a full knowledge of equipment safety, produce a high quality of equipment maintenance, provide additional qualified operators and afford greater promotional potential for the individual student. (A similar program is planned for the Fall).

Other ongoing programs include the development of the Annual Maintenance Conference Calendar for Fiscal 1976 as well as providing training material for a Surface Rating System.

The monthly series of "Training Tips" have been well received as they focus on proper procedures for crew foremen and crews. The "Tips" are prominently displayed in all crew depots and garages.

Maintenance Training will continue to be planned and developed on an "in house" basis as well as contractual services.

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BUREAU OF TRAFFIC OPERATIONS

BUREAU OF TRAFFIC OPERATIONS

Traffic Engineering serves as the agency responsible for assuring maximum safe utilization of our highways.

The influence of our economy, continuing over from fiscal 1975, has dictated to the quantity of traffic engineering improvements the Bureau has been able to render to the Massachusetts highway net. Conservation of energy and monetary resources has been a continuing responsibility of the Bureau.

Signal and Lighting Unit

During fiscal year 1976 the Signal and Lighting Unit had varied tasks to perform that were quite diverse in nature.

A. Traffic Signal Inventory:

Significant progress has been made during Fiscal 1976 toward completing the Traffic Signal Inventory and making the inventory computer program operational.

At the close of Fiscal 1975 all Districts were requested to begin work on the inventory. The work was to consist of a physical inspection and data gathering at each State owned traffic signal installation as well as office work for data correlation.

In January of 1976, the Data Processing Section began work on a computer program for the traffic signal inventory. By April 15, 1976 a set of seven data coding sheets had been developed to enable District personnel to code their data efficiently and accurately. This afforded keypunching a familiar input format so as to minimize keypunching errors.

From May 18-20, 1976 three training sessions were held at Districts 3 and 6, and at 100 Nashua St. to familiarize District personnel with the procedures for completing the signal inventory coding sheets. All Districts were in attendance. As of July 1, 1976 all inventory data for Districts 1, 5, 6 & 8 has been coded, keypunched, and input to the computer storage file.

Work on the computer program is progressing rapidly. We are presently able to select and output specific data from three of the seven input coding sheets on an individual basis. When all seven subroutines are complete, all data with common signal permit numbers will be integrated to create the final version of the computer program.

In addition, the Traffic Engineering Section is currently developing a Standard Operating Procedure for the continuous updating of the Traffic Signal Inventory.

The Traffic Signal Inventory will be fully operational during the coming Fiscal year, 1977.

B. Project Review:

The Signal and Lighting Unit has reviewed a total of 250 project locations designed under the Urban Systems, TOPICS, Highway Safety, State Aid (Chap. 90) and Federal Aid Programs. The projects were submitted by both Design Consultants and the eight Districts.

C. Project Design (In-House):

Due to current economic problems and the diminished amounts of available funding, consultant services have been curtailed making it necessary for the Department to design some of the priority safety projects in-house. Two of the larger projects currently under design are the Lord Overpass and Towers Corner Project in Lowell.

Other services rendered were: review of a "drying and curing oven" electrical circuitry design prior to construction of the oven in the Wellesley Sign Shop; plus advice and counseling to Cities and Towns concerning traffic signal system problems.

D. Motorist Aid Call Box Systems:

Motorist Aid Call box system installations were continued during Fiscal 1976. Construction was completed and acceptance test performed on the four projects started in Fiscal 1975. In addition a portion of Rte. I-495--Milford to Hopkinton--was let out for construction. With the completion of this last section of I-495, scheduled for completion in Fiscal 1977, approximately 210 miles of limited access highways will have emergency communication facilities. Motorist Aid Call Box Systems now include the complete I-495 circumferential highway, I-95 south and I-93 (major radial highways) and I-91, major north-south and I-195, major east-west highways. The system, comprising about 840 call boxes, is controlled from six State Police jurisdictional areas throughout the State.

E. Closed Circuit Television System:

The I-93/Central Artery Closed Circuit Television System construction was completed this year.

Traffic Operations contributed technical advice relative to system functional problems. The acceptance test has now been completed on this project and the effectiveness of the system in traffic incident detection has been demonstrated to several groups.

F. Sophisticated Systems:

The design of a Highway Condition Warning and Advisory System for the Braga Bridge between Fall River and Somerset over Mount Hope Bay

was authorized this Fiscal year. The system will provide warning to the public and DPW forces of the hazards of wind, ice, snow, fog, accidents and maintenance work on this bridge. A design plan is being prepared at present that will detail the design features and methods to be specified for the project. The project is expected to be advertised during fiscal 1977.

G. Highway Lighting:

The lighting unit has continued the energy conservation program which was initiated during the previous fiscal year. A strict application of the Department's highway lighting warrants is being employed to insure that lighting is being installed only in areas where it is required for safety reasons.

All new lighting designs are utilizing the latest and most efficient product applications to keep energy usage at a minimum. An investigation was initiated to clarify the basis for the electric energy rates as charged to the Department and to determine what measures, if any, could be taken to reduce the overall cost of electricity to the Department.

Traffic Engineering contributed a member to the Governor's Council on Energy Conservation during Fiscal 1976. Energy saving ideas were proposed to save at least 15% of the Government's consumption of energy in state buildings and in transportation primarily by increasing efficiency.

Signs and Pavement Markings Unit

During Fiscal 1976 the main workload of the Traffic Engineering Signs and Pavement Markings unit was channeled in five specific areas -- Signing, Pavement Markings, Standards and Specifications, Route Changes and Descriptions and special projects.

The Sign Unit has the continuing responsibility of reviewing the signing for Department (Highway Design) and consultant projects along

with the implementation of our own sign projects. This past year the unit reviewed forty (40) submissions for interstate and state highway contracts containing approximately $5,000,000 in signing. The unit also reviewed seventy-five (75) submissions for signing on Safety Improvement (High Hazard Location) projects during Fiscal 1976.

Two special sign projects - The Street Name Sign Program, and the Massachusetts Information Signs in Roadside Rest Areas were completed during Fiscal 1976. The Installation of Traffic Control Devices at Railroad Crossings was partially completed with two remaining contracts to be advertised for bid proposals during the upcoming fiscal year.

The primary objective of the Street Name Sign Program is the prevention of accidents by providing concise and adequate signing at street intersections for the stranger in order that he may readily find his desired destination. It was implemented in November, 1974, with Phase I of a two-phase program. Forty-six (46) cities and towns within the Route 128 periphery plus eleven (11) cities and towns outside Route 128 were invited to participate in this program. Only thirty-three (33) cities and towns responded, however, and as a result the Department supplied 10,103 street name signs which were installed by local forces on those numbered route within the community.

The Massachusetts Information Signs in Rest Areas program consisted of erecting special porcelain-enamel steel information maps in roadside areas across the Commonwealth. Its main Purpose is to aid tourists in getting to their destinations.

The installation of Traffic Control Devices at Railroad Crossings program to date consists of the application of white and yellow reflectorized pavement markings and the installation of warning and regulatory signs at nine hundred and seventy-six (976) railroad crossings statewide under four separate contracts. The funding for this project is under Section 203 (Rail-Highway Crossings) and

Section 230 (Federal-Aid Safer Roads Demonstration Program) of the Highway Safety Act of 1973. Cost for this project totaled $1,665,687,80. The cost for the remaining railroad crossings is estimated at $555,000.

During the past year the Pavement Markings Sub-Unit has reviewed a multitude of projects designed by consultants and Department personnel. These were designed according to the latest standards set forth by Massachusetts Manual on Uniform Traffic Control Devices for Streets and Highways. Thermoplastic markings are being used where traffic volumes warrant them.

The Chief Engineer, through the Sign Unit, has submitted to the Federal Highway Administration in Washington, D. C. new concepts and prototypes in signing for acceptance by the National Joint Committee. Two submissions were recently made. The first was a new graphic sign for the exclusion of pedestrains, bicycles and horses from limited access highways. This sign incorporates three symbols; a person, a bicycle, and a horse with a red circle and red diagonal slash superimposed on them. The second sign is a graphic Bus Stop sign containing the symbol of a bus, a large "T" and round top. Both these submissions have been approved by the National Joint Committee to be used on an experimental basis.

Speed Regulation Unit

The Speed Regulation Unit for the past year has continued monitoring vehicular speeds on our state highways for the Department and Federal Highway Administration. Reports have been submitted quarterly to the F.H.W.A. showing the average speed, media speed and 85th percentile speed of motorists. The study also indicates the percent of motorists exceeding 55, 60 and 65 miles per hour.

Operations and Safety Unit

The Operations and Safety Unit continued Department Accident Record Data Acquisition Program, supplying accident information to District forces, consulting firms and municipalities. This data was

used to established high hazard locations and priority locations for safety improvements.

This year the System function has been expanded to allow the District Offices to have direct access to summary-accident data via remote computer terminals.

Historical accident data has, this year, been incorporated into the program to aid in "before and after" studies of safety improvements and economic benefit-cost analyses.

Plans are currently being developed to expand our records system to incorporate all reportable accidents statewide. This system would allow for local cities and towns to obtain accident information on municipal roadways within 24 hours.

The Unit is also undertaking a research study to determine the effectiveness of certain message changes at signalized intersections where pedestrian signals are located. The Department has been given approval to conduct this experiment by the Washington Office of F.H.W.A.

Numerous operational studies were conducted by the O. & S. Unit ranging from recommendations to improve traffic flow on construction projects to the effects of land use on traffic flow.

The majority of funds under Chapter 90-33B was committed during fiscal 1976.

There is a continuing program for review of projects designed under the Highway Safety Act.

Administration of Highway Safety Programs

The Bureau of Traffic Operations continued to expand various highway safety improvement program thru the "1973 Highway Safety Act." The following is a summary of Federal funds programmed and/or approved in fiscal 1976:

Improvement to High Hazard Locations Program	$3,598,145.19
Elimination of Roadside Obstacles Program	1,695,009.60
Safer Roads Demonstration Program	2,184,235.20
Railroad-Hwy. Grade Crossings Imp. Program	1,908,139.30

Pavement Marking Demonstration Program	327,145.00
Total	$9,712,676.09

Working in conjunction with the Governor's Highway Safety Bureau the Department has continued several of its innovative highway safety programs as well as designed new programs for implementation in Fiscal Year 1977. A synopsis of the continued programs are as follows:

1. Through the "Identification of High Accident Locations Program" the Department was granted $19,970.00 to update the Base Maps used to designate accident locations on a statewide coordinate system.
2. Aided by the acquisition of equipment funded through the Governor's Highway Safety Bureau over 1,000 bridges received inspections for structural deficiencies by the Bridge Inspection Unit.
3. The Bureau continued to fund the salaries of four (4) Department employees connected with the administration of highway safety programs.
4. Approximately $50,000.00 was granted to local municipalities to aid them in the purchase of pavement marking equipment, signs and traffic counters.
5. A contract was awarded for over $100,000.00 for Warning and Regulatory Signs to be distributed among nine (9) cities and towns.
6. Cataloging activities were continued by both the Department's Skid Investigation Unit and the Photologging Unit.

The following is a summary of new safety programs initiated in Fiscal 1976 and funded by the "Governor's Highway Safety Bureau."

1. The layout of Pass/No-Passing Zones on the entire state highway system utilizing electronic measuring components.
2. The replacement of damaged impact attenuator parts utilizing

funds provided by the Governor's Highway Safety Bureau.

3. The hiring of an Assistant Civil Engineer to aid local communities in designing highway safety improvement programs.

Throughout Fiscal 1976 the Bureau continued to administer various Engineer Training Programs covering the latest state-of-the- art techniques in safe highway design.

TOPICS Unit

During Fiscal 1976 the TOPICS Unit has submitted Areawide TOPICS Plans for 41 communities, Functional Design Reports for 29 TOPICS-type projects, Environmental Assessment Reports for 30 projects, 75% Preliminary Plans for 27 projects, 100% plans, Specs and Estimates for 18 projects and 20 final Traffic Control Agreements.

During the past year fourteen (14) signal system updating projects were completed.

Thirteen (13) Safety Improvement Projects have been advertised for an estimated total cost of $5,472.00. Also during fiscal 1976 the TOPICS unit has expedited the traffic engineering review for 6 projects at the 25% stage, 41 projects at the 75% stage and 44 projects at the 100% stage.

Regulations Unit

The basic activities of this Section are:

a) Drafting and reporting on proposed legislation

b) Advice to cities and towns on regulations

c) Responding to court summonses of Department records

d) Processing Permits for School Zones and eventual reimbursement of the cost to municipalities

e) Reviewing Traffic Control Agreements

During this year, the supervisor of this section was chairman of an in-house committee reviewing and making revisions in the MUTCD. A major change was allowing approval of four-way stop signs according

RESEARCH & MATERIALS SECTION

RESEARCH & MATERIALS DIVISION

The Research and Materials Division has its headquarters in Wellesley and is responsible for a wide variety of physical research projects and for complex materials testing.

MATERIALS TESTING SECTION

One of the Division's major components is the laboratory. For testing and detailed analysis purposes, this is divided into four units, as noted:

1. Bituminous: quality control of asphalt and bituminous concrete mixes, and testing and evaluation of new products.
2. Chemical: paint, chlorides, pesticides, adhesives and many other products are analyzed.
3. Concrete: portland cement and concrete are tested as well as reinforcing steel, brick, pipe and fencing materials.
4. Soils: earth materials - gravel, sand, peat, loam, etc. are analyzed.

BITUMINOUS UNIT:

The responsibilities of this unit as in the past years, were both the routine control testing and investigation of bituminous materials, mixes, pavements and other related materials which are utilized in the Department's construction and maintenance projects. The bituminous unit is subdivided into two sections for the efficient handling and testing of liquid, semi-solid bitumens and bituminous concrete mixes.

During the past year, this testing unit continued to use the low temperature ductility test and other pertinent AASHTO tests to evaluate the quality of asphalt cements being supplied to the various State projects. The bituminous unit also performed various cooperative tests and demonstrations for several of the asphalt suppliers in order to secure consistent test procedures between the involved testing laboratories.

The Bituminous Unit's Test procedures and equipment, as in the past years, met the requirements of the AASHTO Materials Reference Laboratory periodic inspection. Due to the lack of sufficient personnel, the amount of testing had to be further curtailed to a "spot check" method which enabled us to test approximately 1000 samples during the past fiscal year.

CONCRETE UNIT:

The primary function of the Concrete Unit in past years has been the quality control testing of Portland Cement Concrete and its individual components; viz. cement; fine aggregate and coarse aggregate. Subsidiary functions include the evaluation of reinforcing steel, bricks, blades, various types of conduits and pipes, admixtures, proprietary related products and various coatings for cement concrete.

In the past 3 years an added group of items, fencing materials, has been added to the Concrete Unit for evaluation and routine testing.

In addition, a Federally sponsored research program has continued into the formulation and use of Polymer Concrete which necessitated the training of 5 department employees at Brookhaven National Laboratories into the intricasies of the unstable chemicals involved. Several field installations have been made to test the feasibility and properties of the polymer materials. Research was performed on a large number of proprietary patching compounds and grouts, both with fast and normal setting times.

We are still involved with the Bureau of Standards (Washington,D.C.) in the cooperative testing of Cement and Concrete (Cement & Concrete Reference Laboratory) and aggregates (AASHTO Materials Reference Laboratory).

The total number of samples tested in the 1975-76 fiscal year was 5500. This represents a decrease in previous years but the complexity of the tests has increased the time required in the testing of many of the items.

CHEMICAL UNIT:

The Chemical Unit continued its primary assigned responsibility which is the testing and evaluation of a great variety of materials used in the work of the Department. This responsibility includes materials used in the construction and maintenance of highways. A secondary responsibility is the evaluation of materials used in

maintenance of the Department's vehicles and equipment. Examples of the former are the testing of the following materials; paints reflective sheeting, deicing chemicals, protective coatings, adhesives, glass beads, herbicides, pesticides, joint sealers, wire and cable and etc. Examples of the latter material are: Motor oil, fuel oil, hydraulic oil, equipment enamel and etc.

Other functions of the chemical unit are as follows: Performs evaluation studies for the Product Evaluation Committee. Performs in-house research on paints and protective coatings and is responsible for the continuing update on paint and protective coatings to take advantage of new technology. Serves as a consultant to Department Engineers regarding the use of protective coatings and various corrosion problems. Serves on various sub-committees of AASHTO and ASTM in the writing of new specification and test methods on a national basis.

In addition to the above, a bridge deck evaluation and inspection unit operates out of the Chemical Unit. It's responsibilities consist of training and assisting district teams in the area of bridge deck corrosion, chloride content and membrane evaluation. Advice is also furnished district personnel on maintaining their inspection equipment.

SOILS UNIT:

The Soils Testing Unit's primary function is the quality control testing of Soils, Soils Aggregate, and their related materials. Example of materials are gravel, ordinary borrow, embankment materials,bridge foundation materials, sands,impervious materials

loams, peats, and other related materials.

The Soils Unit follows all AASHTO Test Procedures to make sure that the department receives specification materials for its highway construction and maintenance projects.

Specifications and American Standards for nursery stock are used for our Department Roadside Beautification Program.

In addition to our regular testing we have working agreements with the U.S. Soil Conservation and the U.S. Geologic (groundwater and geologic) Survey for testing and classification in connection with research projects. For Massachusetts there is also related Geologic and Soils and Foundation testing and field work that must be done. Samples tested for department and related organizations amount to about 500 samples.

FIELD MATERIALS CONTROL SECTION

The Field Materials Control Section has the responsibility for the monitoring of the plants which manufacture products used in highway building. There are more than two hundred bituminous concrete, cement concrete, and aggregate processing plants in the State, which at one time or another, service Department projects. Their manufacturing equipment techniques and controls must be approved by this unit.

All other manufacturing plants, such as steel, prestressed concrete, pipe, catch basin and manhole block companies must also be inspected

and their products approved on a regular basis.

In addition to their plant monitoring, this Unit is responsible for all progress and final record sampling on Federally Aided construction projects (214 of them in 1976), and is also charged with detailed review of materials documentation on these projects.

SOILS AND FOUNDATION SECTION

TEST BORINGS:

Four advertised boring contracts were done in Fiscal 1976 as follows: Route I-190, Sterling-Lancaster, Speen Street, Natick, Ashby Route 31, and Northeast bypass Amherst-Hadley.

The Department's two open-end boring contracts had twenty-nine projects, District 1,2 and 3 had 14 projects and District 4 thru 8 had 15 projects.

The Department's test boring crew computed 22 projects in Fiscal 1976 in District 1,2, and 3 there were 6 projects and in Districts 4 thru 8 there were 16 projects. Due to the limitation of the equipment and the funding the Department uses contractors to complete test boring programs.

Design Bearing Ratio was obtained for 9 projects throughout the State. Sub-grade materials were tested by the California Bearing Ratio Method to obtain a Design Bearing Ratio which is used by the Pavement Design Engineer to determine the pavement requirements for the Department's layered pavement design.

Several soils reports submitted by consulting engineers were reviewed and comments forwarded to the Design Section.
Several well studies for Right of Way were done on domestic water supplies affected by construction.
The Soils and Foundation Laboratory performed all the necessary testing for the Soils and Foundation Unit which consisted of Gradation, Classification, California Bearing Ratio, Atterberg Limit and Organic content tests.

SOILS ENGINEERING, RESEARCH AND FIELD INSTRUMENTATION

This unit continues to review the technical aspect of all soil reports submitted for proposed department work to ascertain that the designs and construction methods are in the best interest of the Department. This often involves a site visit and where special problems occur, is followed up by construction inspection.
This unit, being the Department's Technical Representative on continuing cooperative soil related research projects, reviews the progress of such projects and has continuous communications with the researchers.
This unit proposed and started two in-house cooperative research projects: (1) R12-7 Evaluation of Rapid Frost Susceptibility Test for Soils, which was begun January 1, 1975 and is proposed to run for three consecutive years. This important project includes a statewide study of frost problem areas from which samples are obtained and laboratory tested for the comparison of test results with field performance.

(2) R12-9 Full Depth Testing of Frost Susceptible Soils

The purpose of this project is to study various soil types under similar environmental and natural freezing conditions. The results and the soil samples of such a study will be made available to those persons working towards development of test procedures to classify soils as to relative frost susceptibility.

MATERIALS SECTION

Approximately 40 construction projects were visited by the embankment and Soils Field Control Engineer to check on material incorporated in construction embankments. The Nuclear Density Gauge continues to be a valuable piece of equipment in determining density and moisture content for soil as well as for Bituminous Concrete. With the introduction of manufactured crushed stone and dense graded crushed stone for sub-base the Nuclear Density Gauge has become an invaluable piece of equipment to measure density and compactive effort.

SKID TESTING

During the 1976 Fiscal Year our Skid Testing Program was continued in three separate phases.

First, an inventory program was continued to test and catalog the entire state highway system, with the interstate highway system receiving first priority to be followed by primary and secondary roadways. Approximately 550 lane miles of interstate highways were tested. As of this time the entire interstate system has been tested and catalogued except for I-90 (Massachusetts Turnpike).

Secondly, a research program entitled "Effectiveness of Alternate Skid Reduction Measures" was continued in conjunction with Midwest Research Institute of Kansas City, Missouri, and in cooperation with the Federal Highway Administration. The project consisted of a before-and-after study of thirty highway sections in Massachusetts to determine the relationship between accident rate and skid number.

Phase I Skid numbers were obtained for these sections of highway during fiscal year 1975, before they were resurfaced.
Phase II Each section was retested after placement of a new surface and a complete report was compiled and sent to Midwest Research Institute, the Chief Engineer, and the FHWA. A total of 375 lane miles of primary and interstate roadways were tested in conjunction with this program. Our on-going program of testing high wet accident areas on request was continued.

Shortly after construction, the skid resistance of new and/or experimental pavements wherever placed are measured, with periodic remeasuring in order to monitor the change in skid resistance and to evaluate the mix design, wearing qualities of various aggregates, etc. Approximately 175 lane miles of primary roadways were tested on this basis.
The winter period was spent collating skid test data and putting this data on computer sheets to be stored in the Department's computer. Methods of comparing these results with wet accident rates, highway geometrics and other variables were developed.

A program for setting up priorities for corrective action for areas which have low skid numbers was initiated. This program will consist of a cooperative effort between Research and Materials, Traffic Engineering, Highway Design and Maintenance. This program as of this time is still in the planning stage.

ENVIRONMENTAL TESTING

Another function added to Research and Materials Section in the past few years has been testing and evaluation relating to environmental matters. This is shared between the laboratory unit and the research unit due to personnel and budgetary limitations. Examples of the duties in this area are: investigation of salt pollution complaints; working with the Highway Design Section to minimize any salt problems which might arise;and making in-house highway noise measurements, evaluation and prediction.

RESEARCH UNIT

During the past fiscal year the Research Unit was responsible for the supervision of twelve studies under the Highway Research Program which is financed in part by the Federal Highway Administration. In addition to these we continued two other studies on a 50-50 basis with U.S. Geological Survey; one of these is the Geologic Study and the other is the Water Resources study.

The following is a list of the Highway Research Program studies which were active during fiscal 1976.

Study No.	Title	Research Agency
R5-5	Roadside Development	University of Massachusetts
R9-0	Hydrologic Study-Small Watersheds	U.S. Geological Survey
R12-2	Movement & Stability of Cuts & Fills	Massachusetts of Institute of Technology
R12-7	Evaluation of Rapid Frost Susceptibility Test for Soils	Massachusetts Department of Public Works,Research & Materials Division
R12-9	Full Depth Testing of Frost Susceptible Soils	Massachusetts Department of Public Works,Research & Materials Division
R18-0	Effects of Deicing Chemicals upon surface and Ground Water	U.S. Geological Survey & Massachusetts Department of Public Works
R21-3	Reduction in Negative Skin Friction	Massachusetts Institute of Technology
R27-0	Surface Characteristics of Pavements	Massachusetts Department of Public Works, Research & Materials Division
R30-0	Evaluation of Bridge Patching Materials	Massachusetts Department of Public Works,Research & Materials Division
R31-0	Evaluation of Internally Sealed Concrete	Massachusetts Department of Public Works,Research & Materials Division
R35-0	Bridge Deck Bituminous Overlayment	Massachusetts Department of Public Works,Research & Materials Division
R40-0	Management Control System	Massachusetts Department of Public Works, Maintenance

The research program has proven to be most beneficial, resulting in improvements in the following areas of highway design, construction, (including materials testing) and maintenance;

R5-5 Utilization of new and available materials for providing an attractive and stable cover for roadside development.

R9-0 Devising a more economical hydraulic design of highway drainage structures.

R12-2 Evaluation of reliability of techniques of predicting settlement, heave and stability of heavy embankments placed on thick deposits of soft soils.

R12-7 Evaluation of rapid frost susceptibility test for soils to allow more readily available and cheaper materials to be used in frost free highway bases and sub-bases.

R12-9 The purpose of this project is to study various soil types under similar environmental and natural freezing conditions. The results of this study hopefully, will aid in the development of test procedures for the classification of soils with reference to relative frost susceptibility

R21-3 The primary objective for this research is to develop methods by which negative skin friction may be reduced economically and to develop bases for predictions leading to comprehensive design methods that will minimize the downdrag loadings.

R18-0 The study to determine "The Effect of Deicing Chemicals on Surface and Ground Water" is expected to lead to improved methods of snow and ice control which in turn will have the twofold benefit of improved winter driving safety and minimal adverse effect on the environment.

R27-0 A major objective of the study of surface characteristics of pavements is the development of improved methods of cataloging the highway system with reference to skid resistance and present serviceability. Ultimately this will lead to the ability to predict the need for resurfacing of highways and improved procedures for design and construction of friction courses and pavements in general.

R30-0 This study will be directed toward the development of actual on the job procedures while researching the effects of varying proportions of various polymer concrete mixtures. A secondary objective will be to determine operational costs as compared to standard Bridge Patching procedures taking into account disruption of traffic and related motorist inconveniences.

R31-0 The objective of this study is to investigate the practicality of using an internally sealed concrete overlay as an exposed concrete wearing surface of a bridge deck. This concrete surface will be sealed internally by adding wax beads to the concrete during mixing after curing the concrete in a conventional manner, the concrete overlay will be heated to melt the wax, causing it to flow and fuse into the capillaries of the concrete, thus internally sealing the overlay.

R35-0 The objective of this study is to: 1 - develop a practical system for removing and replacing a bituminous overlayment on a bridge deck without damaging the existing waterproofing membrane

2 - To design a replacement overlayment to have sufficient stability to resist distortion that may be caused either by the stresses that are induced by sudden changes in traffic velocity or by slippage of the overlayment due to the grade.

R40-0 The objective of this research project is to adapt and implement a management system appropriate for the Massachusetts Department of Public Works through which highway programs may be selected, planned, organized, directed, controlled and evaluated.

PROCEDURES & RECORDS SECTION

PROCEDURES & RECORDS SECTION

THIS SECTION IS RESPONSIBLE FOR THE CONTINUOUS, COMPREHENSIVE AND SYSTEMATIC REVIEW OF THE RECORDS, POLICIES AND PROCEDURES RELATING TO THE TECHNICAL OPERATIONS PERFORMED BY ORGANIZATIONS REPORTING TO THE CHIEF ENGINEER.

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I. MAJOR ACTIVITIES

A. Construction Compliance

Review of field operations to ascertain the degree of compliance with established policies and procedures. Engineering teams from the Section conducted approximately Ninety-two (92) In-depth Reviews of active Highway and Bridge Construction Projects throughout the State. A circumspect review and audit of all records relating to documentation for pay quantities and control of materials and equipment incorporated into the project is conducted to assure that project is in compliance with Contract Specifications, Department Standard Operating Procedures and other controls; also to render assistance where required. This phase of the review is followed by a field inspection in company with the Resident Engineer, of work completed and in progress. Various construction operations underway are observed to assure that accepted practices and controls are being maintained by State personnel and the Contractor. Where applicable, check measurements are taken to ascertain conformance with Specifications. In addition, the Contractor's overall compliance with OSHA (Occupational Safety & Health Act) requirements are evaluated together with measures taken to provide protection to the traveling public. Detailed reports of these reviews are prepared together with any recommendations and submitted directly to the Chief Engineer, with copies distributed to Research & Materials Division, Construction Office, the respective

I. MAJOR ACTIVITIES (cont)

District, and to the Division Office of the Federal Highway Administration.

In addition to review of all facets of the project relating to construction, the format for the Project Review Report has been broadened to include EEO Compliance with particular emphasis placed on project compliance with required record keeping, report submissions and includes an in-depth progress summation of the status of On-the-Job Trainees for those projects containing this Special Provision as part of the contract. An additional copy of each report is distributed to the Section's EEO Unit to keep them informed of the overall compliance pattern and advised of any potential problem areas.

B. EEO - External (Contractor) Compliance

Responsibility to assure contractor compliance with equal employment opportunity, non-discrimination and affirmative action was delegated to the Procedures & Records Engineer and the Section via his designation as Department EEO Coordinator. The Section and, in particular, the EEO Unit (EEO Administrator and Assistants) have developed procedures to implement and review compliance as follows:

1. Federal Contract Provisions - Preconstruction Conferences are conducted for every Federal Aid Project thus providing instructions and clarification to Contractors and Department project personnel.

The Section analyses the Resident Engineer's Monthly EEO Reports (every active Federal Aid Project).

The Section analyses the Construction Compliance Reports (see A. Construction Compliance).

Thirty-four (34) On-site EEO Compliance Reviews were conducted during the past year. The reviews were conducted both independently and in conjunction with personnel of the Division and Regional

I. MAJOR ACTIVITIES (cont)

Office of the Federal Highway Administration.

Over the past year, Contract Special Provisions on certain Federal Aid Projects have stipulated assignment of On-the-Job Trainees (a total of 112). As set forth in the contract, prior to start of construction, the Contractor must submit his selection of trainee(s) classification and then his proposed training program for approval by the Department EEO Coordinator. Following review and approval, the program is forwarded to the FHWA Division Administrator for concurrence.

During this fiscal year, three (3) minority-oriented organizations (New Bedford, Lawrence and Lynn) were employed as consultants to provide supportive services to On-the-Job Trainees. The services provided relate to recruitment, developing good work habits, counseling, follow-up, etc. 100% Federal reimbursement is received for the direct services but time expended by Section personnel in monitoring the work and processing of invoices are absorbed by the Department.

Bid Conditions (Boston and New Bedford) Hometown Plan Areas establishing goals and timetables are applicable on Federal Aid projects where specified and since Part II places compliance responsibility with the administrative agency (the Department) the P&R Section has that obligation also.

The Special Provision relative to Minority Contractor Participation developed by the Section and others was adopted by the FHWA on a national basis. This provision provides for prime contractors to contact minority contractors and extend to them an equal opportunity to negotiate subcontracts.

2. State Contract Provisions - The State Affirmative Action Program (mandating minority manhour goals) was extended from specific

I. MAJOR ACTIVITIES (cont)

geographical areas to the entire State during the past year. The Section is the designated agent of the Mass. Commission Against Discrimination for assuring primary compliance. Project Quarterly Manning Tables and Weekly Manpower Reports of Prime and every Subcontractor must be reviewed and analysed.

A Minority Contractors (Set-Aside) Provision (developed by others) is being implemented on a trial basis (five (5) projects contain 2% to 4% set-aside). The Department EEO Coordinator will chair the Liaison Committee and the Section will monitor compliance.

C. Statistical Reports

The Section has the responsibility for compiling and processing the substantially increased work load of statistical reporting requirements of the Department in the area of EEO and Civil Rights as follows:

Federal Requirements

1. Optional Form 66 - Office of Federal Contract Compliance-Monthly Manpower Utilization Report
2. PR-1391 - Contractor's Monthly EEO Reports
3. PR-1392 - Annual Summary of Contractor's Work Force for Month of July (Statewide)
4. FHWA-1409 - Contractor's Quarterly Training Report (each Trainee)
5. FHWA-1410 - Summary of All Trainees (Statewide)
6. FHWA-1405 - Report of Contracts & Subcontracts Awarded to Minorities (Quarterly)
7. Contracting Activity Report - Monthly listing of projects advertised and awarded in Bid Condition Areas. Section assigns OFCC Number (e.g. BO-DOT(H)-7-74-006; NB-DOT(H)-7-74-007).
8. Post Contract Implementation Report - Summarizes Optional Form 66 Reports for each Contractor/Project and trade utilized including subcontractors. This monthly form addresses a total of 11 categories regarding manpower utilization in Plan Areas.

I. MAJOR ACTIVITIES (cont)

Federal Requirements (continued)

9. DOT Quarterly Report - A report submitted to FHWA Division Administrator on Project and/or Home Office Reviews conducted during preceding quarter with findings; a Schedule of Reviews for next quarter and includes a listing of Preconstruction Conferences and Pre-Bid Meetings attended.

10. Youth Opportunity Program - Again, the Section prepared and distributed correspondence and Form FHWA-1469 to all Contractors and Consultants soliciting them to provide employment for disadvantaged youths in the Highway Industry. As requested by the FHWA, a final report was submitted listing required statistical information secured from a survey of participating companies, conducted by this Section.

State Requirements

1. Mass. Comm. Against Discrimination - Affirmative Action Compliance Report (Monthly)

2. Projected Manning Table (Quarterly Report for duration of project submitted by Contractor and each Subcontractor), Form is broken down into projects, by week, or workers required in each trade (minority or non-minority).

3. Weekly Manpower Report - Reflects hours worked in each trade by each employee, identified as minority or non-minority (Contractor and Subcontractors).

4. Monthly EEO Report - Private Survey Parties. A summation of compliance reports from Consultant Firms.

D. Civil Rights - Title VI Guidelines

The overall responsibility for initiating and monitoring Title VI (1964 Civil Rights Act as amended) activities has been assigned to the Procedures & Records Engineer and the Section. The Section is responsible for monitoring the compliance with these Guidelines in conjunction with the designated Civil Rights Officer in each of the nine (9) Federal Aid Program Areas; and submission of an annual summary report of compliance. In-depth Reviews were conducted jointly with the Federal Highway Administration in each of the following areas:

1. Design
2. Right of Way
3. Construction
4. Administration

I. MAJOR ACTIVITIES (cont)

D. Civil Rights - Title VI Guidelines (continued)

This program is involved in ensuring that no one in Massachusetts is denied the benefits of; excluded from participation in; or is subjected to discrimination under any Federal-aid Program.

E. Action Plan

Personnel from this Section have been coordinating the re-write of the Action Plan in conjunction with the FHWA.

F. Standard Operating Procedures

The Section has continued to review all proposed new or revised Standard Operating Procedures concerning engineering or technical operations of the Department. Where necessary, investigations were conducted to provide clarification of procedures or enunciation of policy.

Of particular note, is the revisions and additional SOP's relative to EEO prepared by the Section.

II. SPECIAL ASSIGNMENTS

In several areas, this Section has been involved on a continuous basis for special assignments:

A. Personnel have investigated problem areas and resolved questions thus expediting Federal reimbursement.

B. Construction Safety - Occupational Safety & Health Act (OSHA) regulations are featured prominently in Construction Project Reviews and the Section has maintained close liaison with the Division of Industrial Safety, Mass. Dept of Labor & Industries.

C. Construction Seminars - The Procedures & Records Engineer and other personnel of the Section participated in the annual meetings with field personnel in the Districts throughout the State.

II. SPECIAL ASSIGNMENTS (cont)

D. Pre-Bid Conferences - As EEO Coordinator, the new contract provisions relative to the Mass. Affirmative Action Program and Minority Contractors' Set-Aside were summarized and clarified by Section personnel at scheduled meetings.

III. LIAISON WITH OUTSIDE AGENCIES

A. Federal Highway Administration - In addition to formal contact with the FHWA Division and Regional Offices, personnel of this Section have participated in Seminars and Workshops conducted at the Regional and National level.

B. AASHTO & AHONAS (NASHTO) - The Procedures & Records Engineer has been an active delegate to these organizations of State Highway Officials. The Section coordinated efforts to schedule the National Convention of AASHTO for Boston in 1978.

C. Other States - Acting as liaison for the Chief Engineer and Commissioner, this Section has prepared replies to general and specific inquiries from sister states.

D. Other Departments, Agencies - Via meetings and correspondence, the Section has maintained liaison ith the Department of Labor & Industries; Department of Natural Resources; Mass. Commission Against Discrimination; Department of Commerce & Development; Mass Turnpike Authority; Metropolitan District Commission and Division of Administration and Finance.

E. Contractor Organizations - A productive relationship of mutual benefit has been maintained with CIM (Construction Industries of Mass.) and AGC (Associated General Contractors).

F. Unions - A cordial relationship with Highway Industry Trade Unions through meetings and correspondence has reduced much tension relative to Equal Employment Opportunity.

III. LIAISON WITH OUTSIDE AGENCIES (cont)

G. Minority Organizations - Civil Rights and EEO duties have involved the Section with minority organizations throughout the State. The Section has developed and is monitoring Contracts for Supportive Services for On-the-Job Trainees with five (5) Minority-oriented Organizations.

H. Liaison Committee - In connection with the Commonwealth's EEO Anti-Discrimination and Affirmative Action Program, the EEO Co-ordinator is an active participant in monthly meetings of the Liaison Committee formed by the Mass. Commission Against Discrimination, as an Affirmative Action body. The Committee functions as a group involved with all matters pertaining to minority recruitment, referral, employment and training. In this regard, weekly reports submitted by Contractors and subcontractors are reviewed for compliance.

DATA PROCESSING SECTION

DATA PROCESSING SECTION

The Data Processing Section presently operates on two shifts in order to accommodate the ever increasing demand for computer processing from almost every unit in the Department. Actual metered time on the computer exceeds 300 hours per month.

The workload for transportation planning data processing continues to grow with extensions being made to the traffic volume system and a more extensive effort in urban studies to respond to the increase in the development of mass transit system.

The Annual Traffic Volume report is now processed on the computer. By providing an automatic record keeping system for all counting stations the data base for the annual report is established. This data can now be stratified in various ways to produce the required report formats.

The Project Information System has been developed to provide the Department management with a means to maintain the hundreds of projects in the development state - i.e. before construction. As each project proceeds from a preliminary study through final design and advertised for construction the computer file is updated to reflect this progress. Estimated completion dates are designated and modified in the data file to correspond to established priorities. Projects may be grouped by regional planning area, funding resource, priority and other categories thereby providing the means to produce a comprehensive overview of all ongoing projects.

Remote teleprocessing to all the District offices has been extended to provide traffic accident data. The remote terminal has also been set-up as an input-output medium for the bridge inventory system. Further progress toward providing the district personnel with a direct contact with the computer is expected with the development of the Maintenance Management System.

Financial data processing constitutes a very significant part of the data processing workload. The computerized systems for expenditures, cost accounting, budget control, current billing and payroll are continually processed. Extensions and innovations to these systems are required frequently. Recently the payroll system was improved to provide year-to-date summaries for earnings and tax deductions on the paycheck stub. This requires establishing year-to-date master files weekly rather than monthly for all earned income. Over the past year there were over 100 requests from the Fiscal Management Section to develop new reports or make variations to existing reports that are processed from computerized systems or data files.